

International Journal of Scientific and Research Publications

Print Version, Volume 10, Issue 9
September 2020 Edition
ISSN 2250-3153



IJSRP Inc.
www.ijsrp.org



DOI: 10.29322/ijsrp

International Journal of Scientific and Research Publications

GENERAL INFORMATION:

IJSRP, International Journal of Scientific and Research Publications publish monthly journal under ISSN 2250-3153.

ONLINE VERSION

<http://www.ijsrp.org/e-journal.php>

PRINT VERSION (E-book)

<http://www.ijsrp.org/print-journal.php>

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A Study About The Social Implication Of The International Labor Migration In Sri Lanka

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DOI: 10.29322/IJSRP.10.09.2020.p10502

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10502>

Abstract.

The study attempts to understand the issue of parent seeking migratory work through a sociological analysis. Migration plays an important role in the population dynamic of a country. There are two types of migration: Internal and International migration. This research is mainly focused on international labour migration. After introducing the open economic system in Sri Lanka in 1977 a large number of consisting both men and women migrated to take up jobs in the Middle Eastern countries, on the other hand the numbers migrating to Italy in search of employment also increased. Under the survey and case study methods data were collected by questionnaire, direct interview and the observation. Families of parents in Sri Lanka engaged in foreign employment are faced with more negative consequences than positive consequences.

Keywords: Labour migration, Population dynamics, International migration, foreign employment.

Introduction

Human migration is a critical process which determines the socio-economic status of a certain country. It can be defined as a key component which affects the population size, growth and distribution except mortality and fertility. Actually, the impact to population growth and distribution from migrations is a proportionate one, indifferent to the influence of the fertility-mortality factors. In Social Sciences, the word 'migrations' is used to describe the geographical movement of a person or a group of people from one place to another.

In a study about the fluctuations of a population, it's convenient to be based on three important factors. They are Fertility, Mortality and Migrations. As Zelinsky remarks, even though fertility and mortality can be calculated and statistically expressed, migrations can't be defined in such an ease (Zelinsky: 1971; P 233). Moving from one geographical area to another is defined as Migrations and the worldwide human migrations can be identified in two fundamental patterns (Ghosh; 1993; P 328).

1. Internal Migration
2. International Migration

Internal migration is the movement of people to settle in another location permanently or temporarily, performed between the administrative regions within the national borders of a certain country which brings a change to its population structure (Hussan: 2005). The movement of people across the international boundaries is International migration. According to United Nations, due to various socio-economic reasons 180 million people which is about 3% of the world population relocate to a different country from

where they were born (United Nations: 2002). International migration has become an important factor for population growth as the population of some countries has rapidly increased as a result of international migrations.

The movement of a person from one place to another within the home country or to a different country with an intention of a job is defined as Labour Migration by the International Organization for Migration (IOM: 2008). Therefore, Labour Migration causes the displacement of valuable human resources from one country to another. This is a process which depends on various attraction-repulsion factors. Collins Encyclopedia identifies, Migrant worker is a person who travels from one place to another to provide the labour (Collins World Encyclopedia: 2005; p 599). In the initial stages, labour migration was based on Brain Drain. Brain drain is a result of numerous factors. The Push factors such as the reduction of the domestic income, ethnic conflicts, insufficient facilities for education and research, unemployment, not getting promoted in the job and the uncertainty about the future, and also the Pull factors like attractive salaries, a higher quality of life and proper facilities for education and research had directly influenced the brain drain from the developing countries to the developed (Ghosh: 1993; p 330-331).

The self-sustaining agricultural economy of the traditional Sri Lankan society was dismantled as a result of colonialization. After the rural community was deprived of their land ownership and the demolishing of agriculture, the villagers sought alternative modes of income via migrating out from their villages. As a result of this phenomenon the open economic model was introduced in 1977 and it fostered a drastic expansion in international relations. Since the beginning of 1980s a large number of men and women migrated to West Asia for foreign employment. It's obvious that these international labour migrations had resulted in certain repercussions in the Sri Lankan family structure.

Research Problem

The wellbeing of a family is a continuous process which depends on the inter relations between the parents and children. Those can be weakened through the inability for the family to live together which is an essential structural component, due to the international migration of a family member. Thereby the research problem addressed in this research is "How does the parents' foreign employment affect the functioning and the well-being of a family?"

Hypotheses

- The negative impact to the family structure caused by the parents' foreign employment is greater than its positive effects.
- A family which is already running under threat will face a significant risk of splitting up due to foreign employment.

Research Objective and Targets

- The main objective of this study is to comprehend the effect of foreign employment for the family structure.
- Identifying the impact of international labour migration linked with foreign employment experienced by the members of a family and proposing necessary measures that can be taken to minimize the negative consequences for the aforementioned family members can be identified as the supplementary targets of the research.

Significance of the study

Despite that international labour migrations from Sri Lanka to foreign countries had conducted from past, it's evident that it didn't cause a direct influence for the sustainability of the family structure. In the traditional Sri Lankan society, a family member or a couple being foreign employed didn't cause a considerable effect for the remainder because of the sizable group of active relatives

which were present in the old days. But the relatives of the modern family are not as much in depth or rooted with past. Even though various scholars in recent history looked into the unskilled labour migrations to West Asia, the labour migrations from Sri Lanka to Italy haven't been into consideration. Therefore, studying the implications for the remaining family members, caused by skilled and unskilled workers getting migrated to West Asia and Italy from Sri Lanka, is a timely requirement.

Research Methodology

As Sociology inspects the social behavior of the human collective, the laboratory for a Sociologist is the Society. Experiments of natural Sciences are conducted inside laboratories while a Sociologist through empirical research examines the society and arrive into certain conclusions (Goode & Hatt: 1952; p 05). According to Best and Khan, a Research can be considered as a process which is well organized and methodological, conducted with an utmost effort and assessed using the scientific method (Best & Khan: 1993; p 20).

Data can be classified into two categories according to their nature. They are Quantitative and Qualitative data (Sarantkos: 1998; p 25). Both Quantitative and Qualitative data were utilized for this research. Quantitative data was used when collecting data such as the number of foreign labour emigrants as men and women, nature of the occupation, number of families, income, expenditure, savings and the age groups. While in collecting data such as the attitude of the wife or the husband about foreign employment, the impact on the socialization process of children caused by the foreign migration of parents, the tendency to develop extramarital affairs, Quantitative data was used. Direct interviews, observation and questionnaires were the data collection techniques used in this research.

The Field of Research and the Research Sample

The study which focused on the way the family structure getting affected by the foreign employment of parents, was conducted by selecting Puttalam District which is an administrative district in Sri Lanka, as its research field. The prime reason for that was the higher percentage of foreign labour emigrants in Puttalam district when compared to the other districts in the country. Wennappuwa divisional secretariat was identified as the area with the highest number of labour migrants from Sri Lanka to Italy. Due to the major scale labour emigrations from this area, Wennappuwa is named as "Little Italy" by the fellow Sri Lankans. Wennappuwa secretariat division records the highest number of foreign employees in the Puttalam district. Apart from Wennappuwa, there are a lesser number of labour emigrants to Italy and Middle-East recorded from Dankotuwa and Arachchikattuwa areas. By considering the number of the foreign employees and representing Wennappuwa, Dankotuwa and Arachchikattuwa areas, a sample of 400 families was selected for this research.

Data Analysis

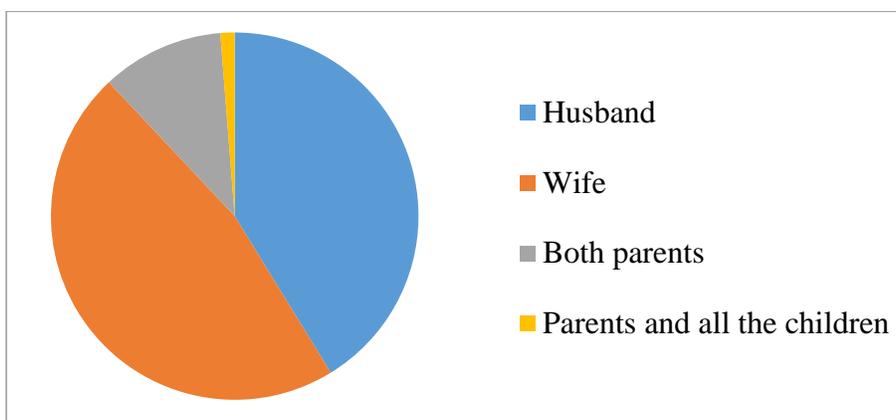
When analyzing the data collected in this research which inspected about the impact on the family from the foreign emigration of parents, the migrated families of the total sample within the research field are as follows.

Table 01: Foreign migrated families

Person/s migrated	Amount	Percentage
Husband	165	41.3
Wife	187	46.8
Both parents	43	10.7
Parents and all the children	5	1.2
Total	400	100

Source: field research data 2015.

Chart 01: Foreign migrated families



Source: field research data 2015

According to the table 1, majority of the foreign emigrants are wives. When the mother, father or both parents are foreign employed, the dependents of that occupation are living in Sri Lanka. These are the family members who are currently living in Sri Lanka while being dependent on the occupations of foreign emigrants.

Table 2: Family members living in Sri Lanka who are dependent on foreign emigrants

Dependents	Amount	Percentage (%)
Husband	172	19.7
Wife	165	18.9
Children	356	40.7
Parents of emigrants	172	19.7
Siblings	5	0.5
Relatives	5	0.5
Total	875	100

Source: field research data 2015

Table 2. reveals the information about the family members living in Sri Lanka who are dependent on the foreign emigrants. In this the participants for the research had the chance to involve in a multiple response method. It highlights the fact that most dependents are children. When considering the population of foreign migrants according to their ages, this is how the husbands and wives within the sample belonged to the respective age groups.

Table 3: The Age groups of the sample

Age group	Husband		Wife	
	Amount	Percentage (%)	Amount	Percentage (%)
Below 20 years	3	0.75	20	5
21 - 30 years	67	16.75	134	33.5
31 - 40 years	202	50.5	152	38
41 - 50 years	104	20	83	20.75
51 - 60 years	13	3.25	3	0.75
Above 50 years	2	0.5	1	0.25
Not mentioned	9	2.25	7	1.75
Total	400	100 (94)	400	100

Source: field research data 2015

According to the table 3, when considering the ages of husbands and wives in the sample of 400 families the majority of them belonged to the 31 - 40 years age category.

Not only the positive but the negative implications of foreign migration of mother or/and father was evident. The ill-effects experienced by children due to the foreign employment of their parents are presented herewith.

Table 04: Negative effects on children caused by the foreign migrant parents.

negative effect caused by the foreign migration of the parents	Amount	Percentage (%)
Not receiving adequate food	81	8.9
Facing health issues	111	12.1
Dropping out from education	99	10.8
Drug addiction	48	5.3
Stubbornness	221	24.2
Becoming violent	127	13.9
Wasting money	56	6.1
Being psychologically affected	106	11.6
Sexual abused	65	7.1
Total	914	100

Source: field research data 2015

When collecting data about the harmful effects experienced it was openly presented enabling multiple response for the respondents. In certain situations, the impact of foreign migration of parents has been a positive one too.

Table 05: The Positive effects on children caused by the foreign migrant parents.

Positive effect caused by the foreign migration of the parents	Amount	Percentage (%)
Having a luxurious life	101	20.5
Adequate money for expenses	83	16.8
Receiving modern commodities	120	24.3
Ability to buy a vehicle	31	6.3
Capability to enroll in educational courses	22	4.5
Receiving fashionable clothes	136	27.6
Total	493	100

Source: field research data 2015.

It should be emphasized that the positive effects were mostly experienced by the children in the families of the foreign labour migrants to Italy. Father getting migrated has resulted in numerous detrimental effects for the role of the mother. Problems such as getting involved in extramarital affairs, negligence of children, facing social reproach, infidelity in public, getting divorced, were identified from the sample. Similarly, wives getting foreign migrated has caused negative influences among the husbands. Problems identified within the sample were getting addicted to drugs, involving in extramarital affairs, wasting the money sent by the foreign employed wife, pawning the household commodities and getting involved in child abuse.

Sri Lankan international labour migrations are causing negative effects for the family structure. But the benefits for the family structure due to foreign employment can also be referred.

Table 06: Benefits for the family due to the foreign migration of the husband or wife.

Benefits for the family due to the foreign migration of the husband or wife	Amount	Percentage (%)
Building a house	138	17.8
Good education for children	118	15.1
A wealth through savings	85	10.9
Fulfilling responsibilities of parents and siblings	69	8.8
Buying a Vehicle	65	8.3
No benefits received	475	100 60.9

Source: field research data 2015.

When analyzing the data on the benefits of foreign migration, it's evident that most of emigrants were interested in building a house. Even though 138 participants had related that they succeeded in that, most of the houses could be seen as partially completed when observed. It should be specially mentioned that the labour migrants to Italy has succeeded in building highly luxurious houses. However, when analyzing the data obtained from the research, it's palpably clear that the negative effects caused by the foreign labour migration of parents is substantially higher than its positive impact.

Conclusion

The study under review out of 400 hundred families which depend on Sri Lankan labour migrants, more mothers are working abroad than fathers. most number of mothers are employed in the middle East while fathers have migrated to Italy for employment Although Italian migrants had a stronger life style, their families had collapsed due to an extra martial affair. Children mainly going on to become delinquents and drug addicts when mothers migrate for work there is a negative impact when it comes to the children's socialization process and labour migrants who are migrated to middle Eastern countries has not helped in alleviating poverty.

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The Risk of Iron Deficiency Anemia Contribution To Febrile Seizures Among Children (6-60) Months

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DOI: 10.29322/IJSRP.10.09.2020.p10503

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10503>

Abstract- Background: Febrile seizure is the most common childhood seizure disorders, affecting 2% to 5% of children aged 6 to 60 months. Some studies have suggested iron deficiency a risk factor for febrile seizure. **Objectives:** to find out the correlation between iron deficiency anemia with febrile seizures. **Methodology:** A descriptive analytical design correlational study, samples were (50) cases and (50) controls, collected from AL Zahraa teaching hospital we measure the serum iron, serum ferritin, total iron binding capacity and transferrin saturation as well as we assess febrile seizures by developed questionnaire consists from 3 parts. **Results:** showed Association between iron deficiency anemia and febrile seizure; about (62%) of the patients and (32%) of control were diagnosed with positive iron deficiency anemia; while only (38%) of patients and (68%) of control showed negative results. Statistical analysis showed that there is a significant association between iron deficiency anemia and febrile seizure (chi square = 6.03 ; p value = 0.022) .**Conclusions:** Children febrile iron deficiency anemia is more likely to occur in seizures. iron deficiency anemia maybe considered a risk factor Predisposes infants to experiencing febrile seizures. serum Iron, serum Ferritin levels were significantly lower in children with febrile seizures than controls group.

Index Terms- Febrile seizures; iron deficiency; anemia; ferritin.

I. INTRODUCTION

Febrile seizures (FS) are characterized as seizures that occur in children aged 6 to 60 months and are followed by fever above 38 ° C (100.4 ° F) and do not include symptoms of infections of the central nervous system. It is the most common cause of infant seizures, affecting 2-5 percent of children annually (Malla et al., 2015).

The Febrile seizures are one of the main causes of pediatric emergency room visits affecting up to one in every twenty children in different parts of the world. Febrile seizures are classified as: a simple febrile seizure is a primary generalized, usually tonic, fever-related, fever-related attack lasting up to 15 minutes and not repeated within 24 hours. The duration can last for a few seconds to minutes and A complex febrile seizure is longer (> 15 min), focal and/or occurring every 24 hours (VII, 2018).

Febrile seizures are associated with fever during childhood. They occur in 2% to 4% of all children in the United States and

Western Europe. Febrile seizures happen more often in boys than in girls (Moghaddam et al., 2016).

Iron deficiency (ID) is characterized as a reduction in the total body iron to the extent that iron stores are completely depleted and there is some degree of tissue ID (Uijterschout, 2015).

More than three billion people worldwide are affected making it the most common micronutrient deficiency. The cause is unclear but many of the disorders are also associated with an imbalance within the brain between excitation and inhibition (E / I) (Rudy & Mayer-Proschel, 2017).

(ID) ranks at the top of three global "secret hungers" (iron, iodine, vitamin A: sub-clinical deficiency without obvious signs of deficiency) with approximately one-fifth of the world's children in the developing world, iron being the most severe single-nutrient deficiency (Sultan et al., 2017).

There are no clear statistics on how many individuals worldwide are affected by iron deficiency, but ID is estimated to be present in most pre-school children and pregnant women in developing countries and at least 30–40% in developed countries when anemia is used as an indirect predictor of ID According to statistics from the World Health Organization (WHO) in 2001, 30% of children are affected by iron deficiency (Özdemir, 2015).

Objectives of the study: to find out the correlation between iron deficiency anemia with febrile seizures.

II. METHODOLOGY

A non-probability sampling technique, purposive sample were (50) cases that male patients made up (66%) while female (34) ; and (50) controls were male (62%) ; and (38%) female, collected from AL Zahraa teaching hospital we measure the serum iron , serum ferritin, total iron binding capacity and transferrin saturation through devices called (Beckman coulter and minividis) as well as we assess febrile seizures by developed questionnaire consists from 3 parts (demographical data, clinical data and Analysis test).

III. RESULTS

Table (1) summarize of the socio-demographic data for studied samples (patients & control) groups.

Items	Sub-groups	Control group Total = 50		Patients group Total = 50	
		Frequency	Percentage	Frequency	Percentage
Age / Months	6-19	20	40.0	23	46.0
	20-33	10	20.0	7	14.0
	34-47	9	18.0	9	18.0
	48-61	11	22.0	11	22.0
Mean (Min-Max) : 26.98 (6-60)					
Length/Height (cm)	45-62	2	4.0	1	2.0
	63-80	21	41.0	22	44.0
	81-98	15	30.0	16	32.0
	99-116	12	24.0	11	22.0
Mean (Min-Max) : 84.22 (45-115)					
Weight (kg)	7-12	22	44.0	23	46.0
	13-18	19	38.0	18	36.0
	19-24	9	18.0	9	18.0
Mean (Min-Max) : 15.4 (6.8-23.1)					
Gender	Male	31	62.0	33	66.0
	Female	19	38.0	17	34.0
Residency	Urban	40	80.0	43	86.0
	Rural	10	10.0	7	14.0
Vaccine Status	Yes	4	8.0	3	6.0
	No	46	92.0	47	94.0
Breast feeding	Yes	28	56.0	26	52.0
	No	22	44.0	24	48.0
Artificial feeding	Yes	15	30.0	14	28.0
	No	35	70.0	36	72.0
Type of convulsion	Generalization	N/A	N/A	47	94.0
	Focal	N/A	N/A	3	6.0
Complexity of convulsions	Simple	N/A	N/A	46	92
	Complex	N/A	N/A	4	8
Convulsion Stop	With Medication	N/A	N/A	1	2.0
	Without Medication	N/A	N/A	49	98.0

This Table shows statistical distribution of control by their socio-demographic data, it explains that the majority of the patients' subgroup are : those with ages between (6-19) years old (40%) ; those with a length ranging between (63-80) cm (41%) ; those with a weight ranging (7-12) kg (44%) ; male (62%) ; urban residence (80%) ; those that were not vaccinated (9%) ; and those with breast feeding (56%) .

while, The patients table show statistical distribution of patients by their socio-demographic data, it explains that the majority of the patients' subgroup are : those with ages between (6-19) years old (46%) ; those with a length ranging between (63-80) cm (44%) ; those with a weight ranging (7-12) kg (46%) ; while the lower percentages were recorded in : those with ages between (20-33) months old (14%) ; those with a length ranging between (45-62) cm (2%) ; those with a weight ranging (19-24) kg (18%) ; the mean , minimum , and maximum values of the age , length and weight

are as follows : 26.98 (6-60) months , 84.22 (45-115) centimeters and 15.4 (6.8-23.1) kilograms respectively .

The results of the current study also revealed that male patients made up (66%) while female (34%) ; those who live urban residents (86 %) while those in rural area constitute (14%); those who have not been vaccinated (94%), those that were fed with breast feeding (52%) ; those that had no artificial feeding (72%) .

As shown in table patients who have a generalized convulsions made up (94%) of the total population versus (6%) for

children with focal convulsions; the percentage of patients that had simple convulsions was (92%) while those with complex convulsions are only (8%) of the total population ; those that their convulsions are stopped without medications made up about (98%) of the total population while only (2%) of the total population did not stop unless using medications .

Table (2): Association between iron deficiency anemia and febrile seizure.

Diagnosis of iron deficiency anemia		Patients		Control		Chi Square (P value)
		Freq.	%	Freq.	%	
.	With IDA	31	62	16	32	6.03 (0.002)
.	Without IDA	19	38	34	68	

This table showed Association between iron deficiency anemia and febrile seizure; according to this table, about (62%) of the patients and (32%) of control were diagnosed with positive iron deficiency anemia ; while only (38%) of patients and (68%) of control showed negative results. Statistical analysis showed that there is a significant association between iron deficiency anemia and febrile seizure (chi square = 6.03 ; p value = 0.022) .

IV. DISCUSSION

According to the table (1)The mean age of onset in present study are within the 1st age groups is 26.98 with the FS occurrence is (46%) considered (6-19) months its agree with the study done by (Majumdar, 2012). comparable to the other studies(Gupta et al., 2015) found the mean age for FS was 28.41 months. Separate studies done by (Nikkhah et al., 2017) and (Lal et al., 2016). (Chandra, 2012) found the average convulsion age to be 17.9 months. It is commonly known that febrile seizures and first febrile seizures are more common in children under three years of age.

In the present study, there was a preponderance of male for febrile seizure. No matter the time of study or the design details; boys have consistently emerged with higher frequency of febrile seizures. Juvenile incidence ratios: girls ranged from 1.1:1 to 2:1(Gencer et al., 2016), (Majumdar, 2012). However present study finding male are more common than female, Whether there is a biological basis for gender-specific differences in susceptibility to febrile seizures, or whether boys are just getting more fever and are therefore at high risk, is not yet established. While the Residency of all the samples was children Who live Urban 86% and 14% was live in Rural.

In the literature receiving diphtheria, whole-cell pertussis and tetanus toxoid vaccine and measles, mumps and rubella vaccine were reported to be associated with a transiently increased risk of FS on the day of vaccination and 8-14 days after vaccination, as shown by (Offringa & Moyer, 2001) and

(Millichap, 2010) According to (Camfield et al., 2002) vaccination constitutes only 2.2% of the febrile seizure. No case was reported following routine vaccination in present study with iron deficiency.

Overall, FS that occurred after vaccination was not found in this study showed that children with vaccine status were 6 % and that the largest percentage was 94 % without this compatibility with study achieved (Seinfeld & Pellock, 2013).

The majority of FS, In present study generalization febrile seizures constituted 94% of the seizures while 6% were focal seizures; the generalized febrile seizure affecting the whole bod, on the other hand focal was involving the arm, leg, or face (or some combination) on only one side of the body, or eye deviation to one side this correspond with(Patterson et al., 2013) and (Majumdar, 2012).

Complexity of convulsions In a study of children with a Complexity of convulsions, There is a relative preponderance of single in a febrile episode most seizures were simple(92%), in present study which comparable to (Ueda et al., 2015), and the complex feature was (8%) but a higher incidence of multiple seizures has been observed in Malaysian children by (Ling, 2001). this findings of Complexity convulsions close to (Chung, 2014). On the other hand, table (2) reveal the relationship between iron deficiency anemia and febrile seizure, (62%) of the patients and (32%) of control were diagnosed with positive iron deficiency anemia ; while only (38%) of patients and (68%) of control showed negative results, Statistical analysis showed that there is a significant correlation between iron deficiency anemia and febrile seizure (chi square = 6.03 ; p value = 0.022) .

V. CONCLUSIONS

Febrile seizures are more common with male than female. Results suggest that IDA may be a risk factor for FS, IDA screening should be considered in infants with the first FS, The incidence of febrile seizure less than three years was higher as

compared to more than three years' age, and Children with FS were more Iron deficient in term of low Hb, low MCH, low MCV, low serum ferritin, low serum iron, high TIBC and low transferrin saturation.

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The Effect Of Employee Work Isolation On Employee Deviant Behaviour In The Hotel Industry Within South-South, Nigeria

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DOI: 10.29322/IJSRP.10.09.2020.p10504

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10504>

Abstract- Today, the rate at which deviant behaviours occur in the workplace have become so worrisome as well as harmful to the wellbeing of the organization which is presently prevailing in most organizations including the hospitality industry. Thus, the purpose of this paper is to study the relationship that exist between employee work isolation and deviant behaviour in the hotel industry within the South-South Region of Nigeria. A survey design was adopted using questionnaire as the research instrument which was distributed to 291 employees of three selected hotels in the South-South region of Nigeria. The data derived were analyzed through the use of Spearman's Rank Order Correlation Coefficient Statistical as well as t-statistics to test the relationship between the variables of the study through the use of Statistical Package for Social Sciences within a significance level of 0.05. The findings showed that employee work isolation has significant influence on deviant behaviour vis-à-vis production deviance, property deviance, political deviance and personal aggression as measures of deviant behaviour in the studied hotels. We therefore recommend that managers of the hotels should encourage and demonstrate collaboration and generosity among employees to reduce personal aggression and other deviant behaviours among employees in the hotel.

Index Terms- Work Alienation; Isolation; Deviant Behaviour

I. INTRODUCTION

The human resources in any organization are very essential to the attainment of the set goal(s) and objective(s) of the organization however to get the best from this important resource has been a major challenge facing both the human resource managers and general manager of all organizations including those in the hospitality industry. Due to the fact that employees bring to the organization different attitude, perception and behaviour that might be different from the culture of the organization, they often exhibit some behaviours (deviant behaviours) that might not be in conformity to the norms and value of the organization. Employee deviant behaviour in the workplace is massively receiving lots of attentions due to its inclination to negatively affect the productivity of the employee and the general performance of the organization, thus, Hamilton, Ogbuigwe and Gabriel (2017) articulated that deviant behaviours result in low

employee and organization's productivity, poor products quality as well as conflict within the organization.

Deviant behaviours in the organization have two major features vis-à-vis are not in prescribed job descriptions and they are in violation of standards in the organization. It has become a day to day happening in the work place and it cut across inconsequential things like going for longer breaks than what is stipulated to stern offence like that of coworkers assaults. Deviant behaviour is a general term for behaviours that are injurious or are anticipated to bring injury to the organization, organizational members or clients which includes lateness to work; filing fake accident claims, unauthorized absence from work, abusing sick day privileges, verbal attack on customers, keeping customers waiting longer than necessary, stealing organization's property and hoarding work-relevant information from a co-worker (Bolin & Heatherly, 2001). It also include playing with ones handset when one is supposed to be working, using the work place internet in downloading materials not related to ones work.

Furthermore, Kelloway, Lori, Matthew and James (2010) expressed that these workplace behaviours mostly do not manifest without been triggered which might be as a result of employee work alienation in the form of employee work isolation. Marx expressed that employee work alienation has to do with a state whereby an employee experience a form of isolation or seclusion and gets separated from their work environment (Deery & Plowman, 1991) which can originate from variation that is outside the control of the person due to the degree of span of control, task specialization as well as excess supervision in the organization. More so, work alienation mostly occurred in organizations where bureaucratic kind of working is dominant (Marshall, 1999) with features such stringent rules, order, task specialization are found to result in depersonalizing and alienation on employees. According to Adler (1999), organizations need to reduce their bureaucratic nature for the employees to be free. The fact remain that bureaucracy has brought lots of benefit to the organization including improvement in organization's effectiveness and output; it however causes employee alienation in the form of self-estrangement, isolation, meaninglessness and powerlessness (Blauner, 1964). Diener (1984) observed that employee that is suffering from work alienation, his or her confidence as well as self-worth might be reduced which can make them engage in deviant behaviour. In the same vein, Eryılmaz (2011) expressed that employees with suffering from work isolation perform very

poorly due to the feelings of incompetency that brings about lack of satisfaction on their work. Employee work isolation disconnect employees from their job as well from the organization which manifest in the form of reduction in worker job participation and commitment (Armstrong-Stassen, 2006).

Today, workplace deviant behaviours have become so depressing as well as harmful to the wellbeing of organizations and is presently prevailing in most organizations including the hospitality industry, the hotels specifically based on the consistent evidences from media concerning workers' dishonesty, poor work attitude, sabotage, fraud, fight at work among many other issues. The characteristics of the hotel industry and its contributions to the economy necessitate quick attention in order to reduce the occurrence of deviant behaviours in the industry, hence the purpose of this study is to examine the relationship between employee work alienation vis-à-vis employee work isolation and deviant behaviours of selected hotels in the South-South Region of Nigeria. Through the analysis of the selected hotels, the study hopes to offer empirical evidence between employee work isolation and deviant behaviour. It is therefore hoped that the outcomes from this study will find practical application in the hotel industry and help to solve some of the inherent problems faced by the hotel sector in terms of consistent deviant behaviours witnessed in the sector.

II. RESEARCH QUESTIONS

The research questions this paper seeks to answer are as follows:

- i. What is the relationship between employee work isolation and production deviance of Hotels in the South-South Region of Nigeria?
- ii. What is the relationship between employee work isolation and property deviance of Hotels in the South-South Region of Nigeria?
- iii. What is the relationship between employee work isolation and political deviance of Hotels in the South-South Region of Nigeria?
- iv. What is the relationship between employee work isolation and personal aggression of Hotels in the South-South Region of Nigeria?

Research Hypotheses

The research hypotheses are stated in the null form and they are as follows:

H0₁: There is no significant relationship between employee work isolation and production deviance of Hotels in the South-South Region of Nigeria.

H0₂: There is no significant relationship between employee work isolation and property deviance of Hotels in the South-South Region of Nigeria.

H0₃: There is no significant relationship between employee work isolation and political deviance of Hotels in the South-South Region of Nigeria.

H0₄: There is no significant relationship between employee work isolation and personal aggression of Hotels in the South-South Region of Nigeria.

III. LITERATURE REVIEW

Theoretical Framework

Social exchange theory was adopted as the background theory for this research work. The theory explains that behaviour is an outcome of exchange processes which seeks to maximize gain and minimize loss. It further explains that the value of the give-and-take relationship that occurs between the employees and the organization is greater when it is voluntary (Blau, 1964). That is to say if an employee know that the organization in which he or she is working has his or her interest (welfare) at heart, the employee will do all within his or her competences in ensuring that the goal of the organization is attained and vice versa. Additionally, business enterprise plays major role in satisfying some certain needs of the workers like the need to be identified, physiological needs and the need of self-esteem; if these needs among others are meant, thus, based on principle of reciprocity; workers will be obliged to provide necessary support needed for achieving its goals since they are aware that the survival of the organization is an important source to satisfying their needs (Taleghani, Divandari & ShirMohammadi, 2009). Therefore, to achieve a balance, employees will try to adjust their interests and behaviours once they noticed that the organization is committed to them. For organizations to be committed to their employees, they have to be fully involved in the day to day operations of the firm. This is because workers who are alienated from their work might display deviant work behaviours as a way of making their angers known in the organizations for lack of involvement. Also, employee alienation in the form of isolation can result in psychological illness like apprehension, gloominess as well as dejection. Thus, the worker feel a sense of isolation which can bring about the feelings that he or she lacks control of his labour, which can result in the violation of substantial corporate values in that way threatening the organizational success. More so, when workers feels they are treated positively or negatively, they reciprocate by also developing corresponding behaviour. Employees who are alienated from their work feel that they are inoperable to their organization.

IV. EMPLOYEE WORK ISOLATION

Employee work isolation as used here has to do with the dimension of employee work alienation. Employee work alienation according to Kongar (2009) is a decline in an individual conformation with his or her surroundings and the reduction in his or her capacity to take control of his or her environments which leads to seclusion, dejection and despair. It mostly occurs when an individual has pessimistic behaviour about others and the world they live in that brings about the feelings that result in discontentment and despondency which can severely affect the performance and behaviours of the affected employee. Thus, Kanungo (1992) expressed that managers must be aware that employee alienation in the organization is an illness that must be prevented. Besides, an individual can experience alienation in himself or herself, home, family, as well as religion. Valadbeigi and Ghobadi (2011) explained that it was Hegel Georg that expanded and clarifying the notion of alienation in the work place. According to them, Hegel believed that alienation occurs when an aspect of an individual is looking strange to him or her. He pointed

out that three stages of alienation exist: the complicated connection between human mentality and object that is unable to be separated from all activity; form of capitalistic objection; and extensive philosophical generalization.

Furthermore, employee work isolation emphasizes the separation of an employee from other individual, teams, events and circumstances that blight his or her relationships (Sells, 2008). Employee isolation occur when they withdraw from their environments and they feel they don't have the ability to fit into any group as well the organization and isolation manifest in two forms: when a person feels he or she is not wanted in the organization; as well when a workers no longer desire the organization in which he or she belongs (Eryilmaz & Burgaz, 2011). Isolation is a form of alienation and experience of loneliness that negatively affects workers especially health-wise (Nicholson, 2009). It can voluntary in the sense that the workers purposely isolate him or herself from activities or events while involuntary isolation are those isolation is forced on workers by others (Biordi & Nicholson, 1995).

V. EMPLOYEE DEVIANT BEHAVIOUR

Employee deviant behaviour has to do with rudely attitude with vague intent to harm and violate organizational norms (Andersson & Pearson, 1999). It is a bad comportment as well as impertinent behaviours individuals display either intentionally or unintentionally to harm the targets who received such behaviours (Everton, Jolton & Mastrangelo, 2007). Deviant behaviours are behaviours exhibited by employees that are not in conformity with organizational norms and values which overall outcome has negative effect on the productivity and performance of the employee as well as the organization. Deviant behaviours are also counterproductive behaviours which are workers actions that violate organizational standards capable of harming organizational wellbeing and its members as well as other stakeholders (Bennett & Robinson, 2003). These behaviours includes but not limited to sabotage, theft, wasting of organizational resources, absenteeism, arriving late to work and leaving early before the closing time. Bennett and Robinson (2000) expressed that organizational deviance has two targets: the number one target is against the individual and it includes behaviours like gossiping, behaving boorishly towards others, and every other action that affect individuals in the organization while the number two target is on the organization itself and includes actions such as, sabotaging organizational properties, coming late to work, using organizational time for individual benefit, misuse of organizational resources, and other behaviours that negatively affects the success of the organization. These behaviours affect organization efficiency and performance as well as its competitive strength. More so, deviant behaviour was categorized to include property deviance which are negative behaviours that are targeted towards damaging tangibles properties of the organization (it include sabotage, thievery, fraud, among others); production deviance which are negative behaviours of employees that are not in line with organizational values including alteration of organization's work required quantity or quality like lateness, taking too much time to executing a given task and smoking when at duty; political deviance are behaviours or communal relationship that puts others in political drawback such as

favourism (gossiping about fellow co-workers to gain favour) and; personal aggression which are displayed behaviours against other workers in the organization such as verbal assault and abuse, sexual harassment and so on (Bennett & Robinson, 2000).

VI. METHODOLOGY

The study adopted the survey research design vis-à-vis correlational design that examines the relationship between employee work isolation and deviant work behaviour. The time horizon that was adopted is cross-sectional while the unit of analysis was on the employee of three (3) selected Hotels in the South-South Nigeria. One each from Rivers State, Akwa-Ibom State and Cross-Rivers State and a visit to the 3 Hotels (the various hotels' human resource managers), we discovered that they have 1014 employees made up of junior staff, middle-cadre staff, senior staff, and management cadre. Out of the 1014 employees in the 3 hotels, 291 employees were used as the sample size gotten through the use of Krejcie and Morgan (1970) sample size determination. We also used cluster sampling to get the number of respondents in each hotel, a hotel been a cluster. More so, selection from the clusters to arrive at sample size was by proportionate sampling complemented with simple random sampling techniques which was done using Bowley's (1964) technique in the determination of unit sampling. More so, the study adopted questionnaire as the research instrument. Employee work isolation is the predictor variable and is used as a dimension of work alienation thus it is operationalised as a uni-variable using Merkke (2015) questionnaire which consist of four respond choices with 5 Point Likert scales ranging from 1 to 5 indicating strongly disagree, disagree, indifference, agree and strongly agree respectively. The criterion variable is deviant behaviour with measures as production deviance, property deviance, political deviance and personal aggression which was operationalised using Bennett and Robinson (2000) deviant behaviour questionnaire consist of four respond choices with 5 Point Likert scales ranging from 1 to 5 indicating strongly disagree, disagree, indifference, agree and strongly agree respectively. Face and content validity was also used for the validity of the research instrument while the reliability of the research instrument indicates a Cronbach Alpha value higher than 0.7; specifically the employee work isolation = 0.925; production deviance = 0.914; property deviance = 0.931; political deviance = 0.928 and personal aggression = 0.919. From the 291 questionnaire distributed, 276(94.81%) copies of questionnaire were retrieved while the remaining 15(5.19%) were not retrieved. More so, out of the 276 number of questionnaire retrieved, 13(4.71%) copies was not useful because it was not filled properly while the remaining 263(95.29%) copies of the retrieved questionnaire were filled correctly which were used for data analysis. The data derived were analyzed through the use of Spearman's Rank Order Correlation Coefficient Statistical as well as t-statistics to test the relationship between the variables of the study through the use of Statistical Package for Social Sciences (SPSS) Windows version 25 within a significance level of 0.05.

VII. DATA ANALYSIS AND RESULT

Relationship between Employee Work Isolation and Production Deviance

Table 1: Correlations Analysis showing the strength of Relationship between Employee Work Isolation and Production Deviance

			Isolation	Production Deviance
Spearman's rho	Isolation	Correlation Coefficient	1.000	.972**
		Sig. (2-tailed)	.	.000
		N	263	263
	Production Deviance	Correlation Coefficient	.972**	1.000
		Sig. (2-tailed)	.000	.
		N	263	263

** . Correlation is significant at the 0.05 level (2-tailed).

Source: SPSS Windows Version 25

Table 1 above indicates that rho = 0.972 and a PV= 0.000 less than 0.05; it means that the relationship between isolation and production deviance in the studied Hotels is very strong, positive and significant. The relationship is further tested applying t-statistics as shown in Table 2 below:

Table 2: Effects of Employee Work Isolation on Production Deviance Coefficients^a

Model		UnStandardised Coefficients		Standardised Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	1.687	.357		4.726	.000
	Isolation	.782	.081	.775	9.705	.000

a. Dependent Variable: Production Deviance

Source: SPSS Windows Version 25

The table 2 above shows a (t-cal. =9.705 and t-crit. =1.96) at significant level of (P=0.000 < 0.05) which indicates a significant relationship between employee work isolation and production deviance. Thus, we reject the null hypothesis; we therefore conclude that employee work isolation had a positive and significant relationship with production deviance in the studied Hotels in Nigeria.

Relationship between Employee Work Isolation and Property Deviance

Table 3: Correlations Analysis showing the strength of Relationship between Employee Work Isolation and Property Deviance

			Isolation	Property Deviance
Spearman's rho	Isolation	Correlation Coefficient	1.000	.987**
		Sig. (2-tailed)	.	.000
		N	263	263
	Property Deviance	Correlation Coefficient	.987**	1.000
		Sig. (2-tailed)	.000	.
		N	263	263

** . Correlation is significant at the 0.05 level (2-tailed).

Source: SPSS Windows Version 25

Table 3 above indicates that rho = 0.987 and a PV= 0.000 less than 0.05; it means that the relationship between isolation and property deviance in the studied Hotels is very strong, positive and significant. The relationship is further tested applying t-statistics as shown in Table 4 below:

Table 4: Effects of Employee Work Isolation on Property Deviance
Coefficients^a

Model		UnStandardised Coefficients		Standardised	t	Sig.
		B	Std. Error	Coefficients Beta		
1	(Constant)	6.584	.390		16.890	.000
	Isolation	.188	.042	.154	2.134	.034

a. Dependent Variable: Property Deviance

Source: SPSS Windows Version 25

The table 4 above shows a ($t_{cal.} = 2.134$ and $t_{crit.} = 1.96$) at significant level of ($P = 0.034 < 0.05$) which indicates a significant relationship between employee work isolation and property deviance. Thus, we reject the null hypothesis; we therefore conclude that employee work isolation had a positive and significant relationship with property deviance in the studied Hotels in Nigeria.

Relationship between Employee Work Isolation and Political Deviance

Table 5: Correlations Analysis showing the strength of Relationship between Employee Work Isolation and Political Deviance

			Isolation	Political Deviance
Spearman's rho	Isolation	Correlation Coefficient	1.000	.588**
		Sig. (2-tailed)	.	.000
		N	263	263
	Political Deviance	Correlation Coefficient	.588**	1.000
		Sig. (2-tailed)	.000	.
		N	263	263

** . Correlation is significant at the 0.05 level (2-tailed).

Source: SPSS Windows Version 25

Table 5 above indicates that $\rho = 0.588$ and a $PV = 0.000$ less than 0.05; it means that the relationship between isolation and production deviance in the studied Hotels is strong, positive and significant. The relationship is further tested applying t-statistics as shown in Table 6 below:

Table 6: Effects of Employee Work Isolation on Political Deviance
Coefficients^a

Model		UnStandardised Coefficients		Standardised	T	Sig.
		B	Std. Error	Coefficients Beta		
1	(Constant)	.277	.203		1.367	.173
	Isolation	.150	.041	.248	3.464	.005

a. Dependent Variable: Political Deviance

Source: SPSS Windows Version 25

Table 2 above shows a ($t_{cal.} = 3.464$ and $t_{crit.} = 1.96$) at significant level of ($P = 0.005 < 0.05$) which indicates a significant relationship between employee work isolation and political deviance. Thus, we reject the null hypothesis; we therefore conclude that employee work isolation had a positive and significant relationship with political deviance in the studied Hotels in Nigeria.

Relationship between Employee Work Isolation and Personal Aggression

Table 7: Correlations Analysis showing the strength of Relationship between Employee Work Isolation and Personal Aggression

			Isolation	Personal Aggression
Spearman's rho	Isolation	Correlation Coefficient	1.000	.782**
		Sig. (2-tailed)	.	.000
		N	263	263
	Personal Aggression	Correlation Coefficient	.762**	1.000
		Sig. (2-tailed)	.000	.
		N	263	263

** . Correlation is significant at the 0.05 level (2-tailed).

Source: SPSS Windows Version 25

Table 7 above indicates that rho = 0.782 and a PV= 0.000 less than 0.05; it means that the relationship between employee work isolation and personal aggression in the studied Hotels is very strong, positive and significant. The relationship is further tested applying t-statistics as shown in Table 8 below:

Table 8: Effects of Employee Work Isolation on Production Deviance Coefficients^a

Model		UnStandardised Coefficients		Standardised Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	4.305	.282		15.273	.000
	Isolation	.290	.064	.275	4.560	.000

a. Dependent Variable: Personal Aggression

Source: SPSS Windows Version 25

Table 8 above shows a (t-cal. =4.560 and t-crit. =1.96) at significant level of (P=0.000 < 0.05%) which indicates a significant relationship between employee work isolation and personal aggression. Thus, we reject the null hypothesis; we therefore conclude that employee work isolation had a positive and significant relationship with personal aggression in the studied Hotels in Nigeria.

VIII. DISCUSSION OF FINDINGS

Any behaviour undertaken by the employee that is not in conformity to the firm's values and standards can be considered as deviant behaviour. In the organization, every employee is expected to follow a set of specific rules and regulations. If an employee does not enact these behaviours deviance may occur. Employee work isolation can reinforce deviance by creating an illusion of invulnerability and complete autonomy. Employee work isolation is perceived as a state of incapability in social dialogues differently from the state desired by the individual (Savikko, Routasalo, Tilvis, Strandberg & Pitlaka, 2005). Work isolation means the cessation of communication with society and with one's close social environment along with the avoidance of making contacts with others in the organization. The analysis of collected data shows that employee work isolation has significant influence on all the dimensions of deviant behaviour vis-à-vis production deviance, property deviance, political deviance and personal aggression in the studied firm. In line with the above finding, Faridahwati, Chandrakantan and Hadziroh (2011) observed that employee work isolation is positively related to deviant behaviour. If employees are isolated from their work it might affect the productivity of the firm, thus Mulki, Locander, Marshall, Harris and Hensel (2008) observed that relationship exist between organizational isolation and the commitment of the employee. When a worker is committed his or her motivation to carry out given task is enhanced whereby he or she ensures that organization attain its goal of productivity. However, when he or she is isolated from the organization, his or her desire to be

committed is truncated. Thus, isolation as a form of alienation reduces one's commitment to the organization which can then lead to negative feelings towards the organization that can affect its productivity. When workers are not fully involved in the organization's processes, they are more likely to exhibit behaviours that are not in line with the standard of the organization (Banai & Reisel, 2007; Leiter, 2005) such as deliberately wasting organization's resources, intentionally, working slowly as well as closing before time which can lead to the reduction of organizational performance. More so, Abdul, Rahim and Aizzat (2016) expressed that when a worker's job lacks identity he or she is very more likely to engaging in deviant behaviour, thus the worker may utilize the organization's properties for him or herself, sabotage the organization's asset and so on. In other words, when workers in the organization are not carried along in the process of taking decision in the organization, the workers feel a sense of alienation which results in developing negative behaviours (such as sabotaging organization's properties) that are not in conformity to the firm's standard. Therefore, organizations need to clarify employees on the roles they will play constantly so that they won't be isolated from their job and the general organization. Workers involvement in decisions making is very important in regards to determining employees' attitudes towards the organization (Nassehi, 2005), thus if employees are isolated from decision making in the organization it may lead to deviance like sabotage and making intentional errors in work. This is because Gilbert, Laschinger and Leither (2010) observed that employees participating in an organization's decision making leads to right

and appropriate behaviours like satisfaction, commitment as well as firm's citizenship behaviour that is void of deviant behaviour. Furthermore, Pelin and Funda (2013) observed that organizational injustice, abusive supervision, and work alienation such as isolation have a positive relationship with counterproductive behaviours in the organization. In the same vein, Cooper and Kurland (2002) observed that employee work isolation is positively related to workplace deviant behaviours. They further suggest that isolation may influence the likelihood of acts of deviance under the conditions of diminished oversight. Employee work isolation can lead to deviant behaviour (Gilbert et al, 2010) such as lobbying to get undue promotion, spreading of false rumours or gossip and bullying other employees in a bid to be in a better position in the organization. By consistently indulging in these deviant behaviours, the general success of the firm can be affected. More so, employees that exhibit non-compliance with the approved procedures and regulations in the organization could actually take care not to be enmeshed in clearly deviant behaviours, such as absenteeism, tardiness, and gossiping about their co-workers in a bid to get undue favour. Abiodun (2013) further expressed that isolation is a major influencer of psychological maltreatment and aggression. Social isolation results in the emergence of emotional and/or psychological disorders in the individual that may lead to deviant behaviour such as verbal abuse on other employees, sabotaging and endangering other co-workers and co-worker backstabbing. Due to the fact that anger, sadness, and anxiety are among the significant symptoms of isolation. Also, workers begin to experience alienation in their organization when they lack informal relationship with others in the organization. More so, one could argue that employee work isolation may lead to workplace deviance leading to increased levels of bullying, harassment, disrespect, and sabotage. This could be due to the illusion of control and social exclusion. The feelings that an employee is not accepted by other workers, he or she may begin to skip work, comes late to work or start bullying other colleagues. Thus, employee work isolation is often the reason for gloominess, which is a pointer to underlying well-being issues that might result in personal aggression such as threats of physical harm and verbal abusive attack.

IX. CONCLUSION

Based on the result of analysis of data collected, we therefore conclude that work isolation significantly affect deviant behaviours vis-à-vis production deviance, property deviance, political deviance and personal aggression of the studied hotels in the South-South region of Nigeria. In other words, if employees are isolated from their work, they are more likely to indulge and exhibit deviant behaviours in their place of work. Every employee in the organization has a set of behaviours, which have to be taken into account to attain firm's purpose and if these behaviours are not in line with set standards, the purpose of the firm could be defeated. The consequences of feeling apart or estranged from the organization can lead to mental-emotional disorder which can lead to deviances. More so, employee alienation may provide organizational climate where workers lacks commitment. Workers who are alienated from their work, have more tendencies to be absent from their work and misbehave in their work resulting in low productivity in the organization. However, while we

recognized that employee work alienation vis-à-vis work isolation can lead employee into behaving defiantly in the organization, it does not generally apply for all employees, due to the fact that some employee might be constraint for fear of been sanctioned as well as losing their job.

X. RECOMMENDATIONS

The following are our recommendations based on our findings

1. The managers of the hotels should encourage and demonstrate collaboration and generosity among employees to reduce personal aggression and other deviant behaviours among employees in the hotel.
2. Managers of the hotels should proliferate and enhance the variety of skills possessed by employees through training to facilitate the movements of workers from one department to the other to avoid work isolation in order to minimize the occurrence of deviant behaviours among employees.

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Application of GIS and Remote Sensing for Developing Watershed GIS

(A case study of the Kosi watershed, District Almora, Uttarakhand)

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DOI: 10.29322/IJSRP.10.09.2020.p10505

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10505>

Abstract- Due to the ever-increasing demand on water resources, the pressure on its judicious utilization is also increasing. Besides being precious, this resource is also complex to manage on account of its dynamic behaviour. It implies that the response to a unit of precipitation input is dependent on the state of wetness of the land mass and the environment prevalent at that time. Therefore, the changing weather conditions as well as the spatial variability of land mass result in nonlinear behaviour of the response of the watersheds. The present work attempts to create a GIS database for Kosi Watershed districts of Almora in Uttarakhand. It extends between 29° 33' 47'' N to 29° 52' 20'' N Latitudes and 79° 33' 12'' E to 79° 48' 11'' E Longitudes in district Almora and cover an area of 462.12 sq.km. Located in the lesser Himalayan terrain. Within this watershed as many as 335 villages, many sub-urban areas and service centers (Someshwar, Majkhali, Hawalbagh, Kosi, Chanoda, Kathpuriya, Sitlakhet, etc) and the Almora Town itself lie in the watershed.

For the study toposheet of the year 1966 the Kosi watershed, district Almora was used, Landsat satellite images of the study area were acquired the years 1990 and 1999. Both data are obtained from Global Land Cover Facility (GLCF). LISS III satellite image of the study was use of the year 2004, obtained from Centre of Excellence for NRDMS in Uttarakhand Kumaun University SSJ Campus Almora. The entire digital database of the kosi watershed prepared with the help of ARC GIS Software which is user friendly and famous software developed by Environmental system research in corporate Redland California. Image classification through ERDAS (earth Resource data Analysis) software developed by Leica Geosystems geospatial Imaging, LLC 5051 Peachtree corners suite 100, Norcross, GA, 30092, U.S.A.

In this study area there are 17 micro watersheds. In the year 2004 forest covers was found in 55.22 percent area. About 30.24 per cent area was barren land. About 13.74 per cent area was Agriculture land. Almora urban area was covered by 0.80 per cent area. The Kosi Watershed is divisible in four absolute relief zones varying between 1000-2700m, and in four categories of relief i.e., Low, Medium, High and Very high. Table 2 contains the distribution of area under different relief zones. Maximum area lies in the medium relief zone which includes 53.11 per cent of the total study area.

Index Terms- GIS, Remote Sensing and Watershed GIS.

I. INTRODUCTION

The word watershed is supposed to have originated from German terminology 'Wasserschiede'. It is a geomorphic unit which defines as the area which contributes water to particular stream or a set of streams. It provides best way to measure water balance and response of various management in development activities. Watershed is a natural integration of all hydrologic process within its boundaries and therefore, is ideal unit for scientific management of water, land and bio-resources. The water, land and bio-resources of a watershed including the energy regime are highly inter-related. Sustainability is an important consideration. To achieve it social, economic, institutional and environmental factors have to be given due weightage, all these highlight the necessity for considering the watershed as a unit for planning. In addition to the argument that a watershed is a logical and natural unit for natural resources management, it also is a unit for man- environment interaction and economic planning.

The space concept of development of water and land resources on watershed basis was first adopted and implemented by Damoder Valley Corporation in 1947 with setting up of a interdisciplinary Department of Soil Conservation. The idea got further boost during 1957 when a series of paper on watershed were presented and discussed in Hazaribag organized jointly by the Food and Agricultural Organization of the United Nations and Government of India. At the national level, however, watershed management concept was introduced only during the Vth Plan for treating the watershed in the catchments of River Valley Projects for reducing sediment inflow into the big reservoirs. Another set of projects for watershed development in rain fed areas were funded by the World Bank, which subsequently was expended as National Watershed Development Project in rain fed areas.

Traditionally, watershed boundaries are drawn manually onto a topographic map. The person who draws the boundaries uses topographic feature on the map to determine where a divide is located. Today computer programs are also used to derive watersheds

from DEMs. Using computer technology, we can generate preliminary watershed boundaries in a fraction of the time needed for the traditional method (Chang, 2007).

Delineation of watersheds can take place at different spatial scales (Band et al. 2000). A large watershed may cover an entire stream system and, within the watershed, there may be smaller watersheds, one for each tributary in the stream system. Delineation of watersheds can also be area-based or point-based. An area-based method divides a study area into a series of watersheds, one for each stream section. A point-based method, on the other hand, derives a watershed for each select point. The select point may be an outlet, a gauge station, or a dam, whether area- or point-based, the automated method for delineating watersheds follows a series of steps, starting with a filled DEM (Chang, 2005).

II. OBJECTIVE

The fundamental objective of the present work develop watershed GIS which includes the study of the following.

- (1) Terrain analysis, i.e., Triangulated Irregular Network, Digital Elevation Model, Slope, Aspect and Drainage.
- (2) To study analysis Land use/Land cover pattern.
- (3) To create automatic watershed delineation.
- (4) To prepare GIS of Socio-economic Infrastructure (i.e. Education Centers, Health Centers, Roads.)

III. STUDY AREA

The Kosi Watershed in district Almora encompassing an area 462.812 km² and extends in between 29° 33' 47'' N to 29° 52' 20'' N Latitudes and 79°33' 12'' E to 79° 48' 11'' E Longitudes in district Almora (Fig.1).Attitudinally the height of the watershed varies between 1000m and 2600m. The Kosi is one of the thickly populated valleys of the Himalaya. Within this watershed as many as 335 villages, many sub-urban areas and service as centers (Someshwar, Majkhali, Hawalbagh, Kosi, Chanoda, Kathpuriya, Sitlakhet, etc) and the Almora Town itself lie in the watershed.



Fig.1: The location map of the Kosi Watershed, district Almora.

IV. METHODOLOGY

For the study toposheet of the year 1966 the Kosi watershed, district Almora was used, Landsat satellite images of the study area were acquired the years 1990 and 1999.Both data are obtained from Global Land Cover Facility (GLCF).LISS III satellite image of the study was use of the year 2004, obtained from Centre of Excellence for NRDMS inUttarakhand Kumaun University SSJ Campus Almora.Figure.2 showing analytical procedures of the present study.

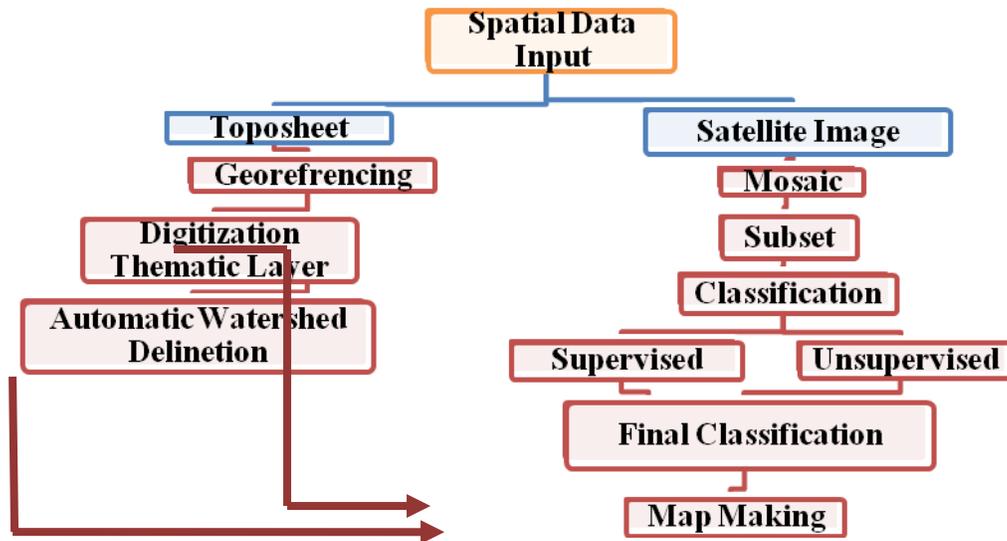


Fig.2: Flow charts showing analytical procedures of the present study.

Entire the digital database of the Kosi watershed prepared in ARC GIS Software. Which is user friendly and famous software developed by Environmental system research incorporate Redland California. In the Arc GIS software, an Arc Map module was used. In Arc Map 3D Analyst used the create the digital elevation model. Spatial Analyst tool use the create slope, aspect, and automatic watershed delineation. Image classification through ERDAS (earth Resource data Analysis) software developed by Leica Geosystems geospatial Imaging, LLC 5051 Peachtree corners suite 100, Norcross, GA, 30092, U.S.A. In this software I used the classification modules for the image classification for different years.

V. RESULTS AND DISCUSSION

Automatic Watershed Delineation

The final step is to delineate a watershed for each stream section. Watershed delineation was for the study area. In this study area there are 17 micro watersheds (Fig. 3.3). The area of these watersheds is presented in the Table1. Maximum area of the watersheds are 14 micro watershed situated in SW portion of the boundary while minimum area are 11 micro watershed.

Watershed	Area in km ²	Area in %
	43.17	9.32
2	22.72	4.90
3	5.63	1.21
4	34.67	7.49
5	43.61	9.42
6	17.75	3.83
7	20.50	4.42
8	51.65	11.16
9	17.37	3.75
10	17.53	3.78
11	2.12	0.45
12	16.78	3.62
13	22.37	4.83
14	58.59	12.65
15	16.50	3.56
16	34.20	7.38
17	37.46	8.23
Total	462.81	100

Table 1: Distribution of area under different micro watersheds Of the Kosi Watershed, district Almora.

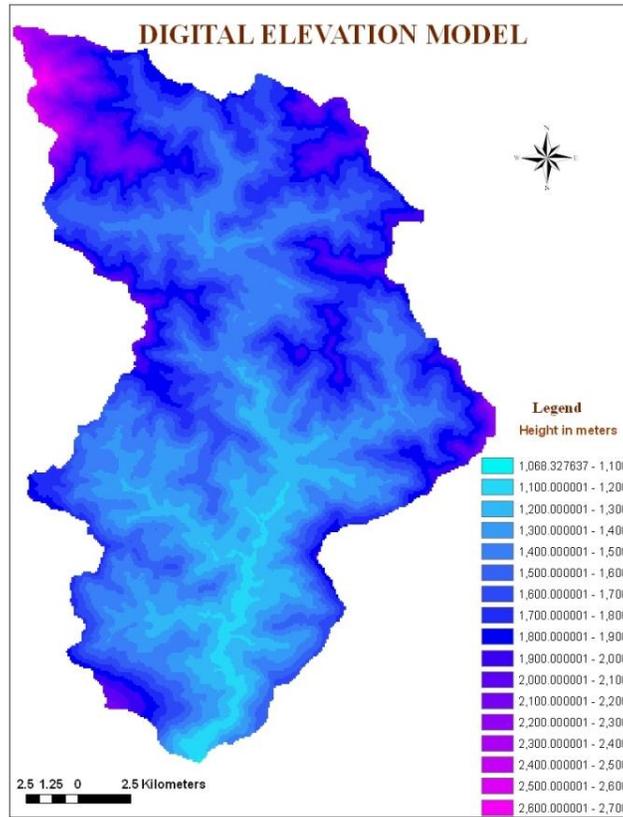
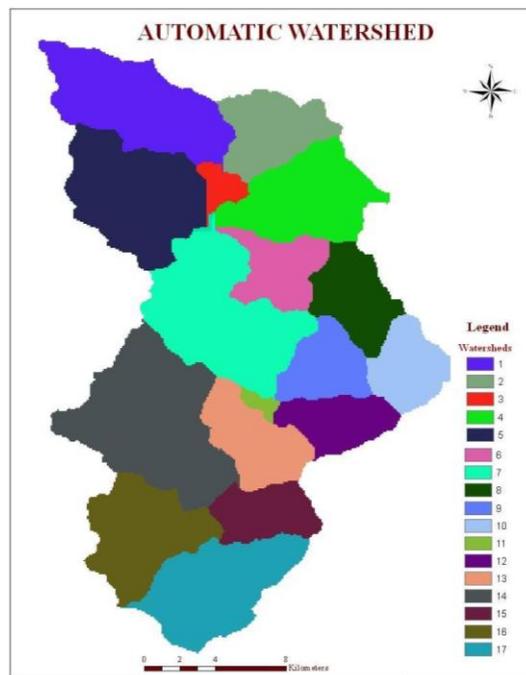


Fig:3 Micro watersheds Of the Kosi Watershed, district Almora



Fig;4 Digital Elevation Model of Kosi watershed, district Almora.

Altitudinal Zones in meters	Area		Cumulative Area		Category of Relief Zones
	in km ²	in %	in km ²	in %	
1000-1100	0.05	0.01	0.05	0.01	LOW
1100-1200	9.34	2.01	9.39	2.02	
1200-1300	38.21	8.25	47.61	10.27	
1300-1400	54.10	11.69	101.72	21.97	
1400-1500	85.05	18.37	186.78	40.35	
1500-1600	69.54	15.02	256.32	55.38	MEDIUM
1600-1700	61.72	13.33	318.05	68.72	
1700-1800	54.27	11.72	372.32	80.44	
1800-1900	38.05	8.22	410.37	88.67	
1900-2000	22.34	4.82	432.72	93.49	
2000-2100	12.88	2.78	445.61	96.28	HIGH
2100-2200	6.67	1.44	452.28	97.72	
2200-2300	3.83	0.82	456.11	98.55	
2300-2400	2.70	0.58	458.82	99.13	
2400-2500	2.36	0.51	461.18	99.64	
2500-2600	1.27	0.27	462.45	99.92	V. HIGH
2600-2700	0.35	0.07	462.81	100	
Total	462.81	100			

Table 2: Distribution of area under different Altitude zone Of the Kosi Watershed, district Almora.

VI. SLOPE

Slope map for the Kosi watershed prepared by using Digital Elevation Model. Figure 5. depicts the distribution of surface Slope within the study area. The Slope of the watershed ranges between 0° to 38°. Table 3 shows the distribution area under different Slope groups in the Kosi watershed. A brief account of spatial distribution of the Slope categories (Table.3) of the Kosi watershed is presented in the following paragraphs.

Gentle Slope- This class all those part of the study area where the slope ranges below 5°. The large area covered by this group in the Nana Kosi, Menol Gad and river basin. In this Group areas which account for 8.99 per cent of the total study area.

Moderate Slope)- The slope angle measures between 5°to15° in these areas of moderate slope which include 41.96 per cent of the total study area. It extends central part the study areas. This is the commonest class of the slope which exhibits the regional picture of slope of study area.

Moderate High Slope- This class includes all these part of the study area where the slope ranges 15 to 25°. In this group the total area is 41.86 per cent. It is observed in which covers North, North East, North West, West, and South West portion of the study area.

High Slope- Slopes ranging between 25°-30° categories which included the 6.13 per cent of the study area. Distribution of the slope group in the linear pattern in the Syahi Devi region forest, kalimath Reserved forest and the north-east portion of the study area.

Steep Slope- As, rule, Steep slope corresponds high relief and relatively hard bed rocks. Here the slope ranges between 30°-35° and it includes 0.98 per cent of the total study area which is small area Bhatkoat east reserve forest.

Very Steep Slope-Only 0.05 per cent part of the total study area falls under the region of very steep slopes where the slope always ranges above 35° such patches of steep slope are mainly distributed small patches in Bhatkoat reserve forest and the West portion of the study.

Slope Groups (in ⁰ c)	Area		Cumulative Area		Remark
	in km ²	in %	in km ²	in %	
0-5	41.60	8.99	41.60	8.99	GENTLE
5-10	79.29	17.13	120.90	26.12	MODERATE
10-15	114.94	24.83	235.84	50.95	
15-20	116.04	25.07	351.88	76.03	M.HIGH
20-25	77.70	16.79	429.59	92.82	
25-30	28.39	6.13	457.99	98.95	HIGH
30-35	4.57	0.98	462.56	99.92	STEEP
35-40	0.24	0.08	462.81	100	V.STEEP
Total	462.81	100			

Table 3: Distribution of area under different slope groups of the Kosi Watershed, district Almora.

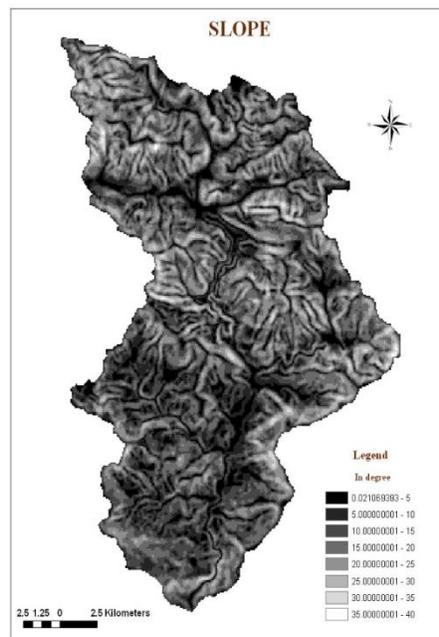


Fig:5 Slope of Kosi watershed, district Almora.

VII. ASPECT

Aspect map for the Kosi watershed was prepared by using digital Elevation Model. Figure 6 depicts the distribution of aspect within the study area. Table 4 shows the distribution area under different aspect groups in the Kosi watershed. A brief account of spatial distribution of the aspects categories (Table 4) of the Kosi watershed is presented in the following paragraphs.

North- The largest area covered by this group falls in the Syahi Devi reserved forest, situated in south-west portion of the study area. Bhatkoat reserve forest is the second largest area of this group which extends in the extreme North of the study area. Third largest area lies in extreme North-West portion of the boundary. One patches lies in the Ganenath reserve forest. Small patches situated in the extreme west of the boundary. In this group account 13.29 per cent of the study area.

North-East- The largest area covered of north-west portion of the study area. The second largest area of this group which extend in the south-west portion of the study area. One patches lies in the west portion of the boundary. 12.12 per cent of the total study area falls under this group.

East- In this group one patches situated in the extreme north-east and south portion of the boundary. One patches situated in the east portion of the boundary. Narrow belt situated in the central part of the area. In this group account for 12.26 per cent of the total study area.

South-East- A wide but largely distorted circular belt in the central part of the boundary falls under this group. In this groups account 13.29 per cent of the study area.

South- It is observed in the form of a linear belt in the east and circular belt in the south-west portion of the boundary. In this groups 15.11 percent of total study area.

South-West- Such conditions are mainly confined in the west and north portion of the boundary. 11.84 per cent falls under this groups.

North-West- This group situated in the north-east, south-east and south portion of the boundary. 10.23 per cent falls under this groups.

West- Ganenath, Chitai and Sitoli reserved forest situated in this aspect group.11.73 per cent falls under this groups.

Aspects Name	Area			Cumulative Area	
	(in ⁰ c)	in km ²	in %	in km ²	in %
N	337.500-22.500	61.51	13.29	61.51	13.29
NE	22.500-67.500	56.11	12.15	117.62	25.44
E	67.500-112.500	57.21	12.36	174.84	37.77
SE	112.500-157.500	61.51	13.29	236.35	51.07
S	157.500-202.500	69.94	15.11	306.30	66.18
SW	202.500-247.500	54.82	11.84	361.13	78.02
W	247.500-292.500	47.34	10.23	408.48	88.26
NW	292.500-337.500	54.33	11.73	462.81	100
Total		462.81	100		

4: Distribution of area under different aspect groups of the Kosi Watershed, district Almora.

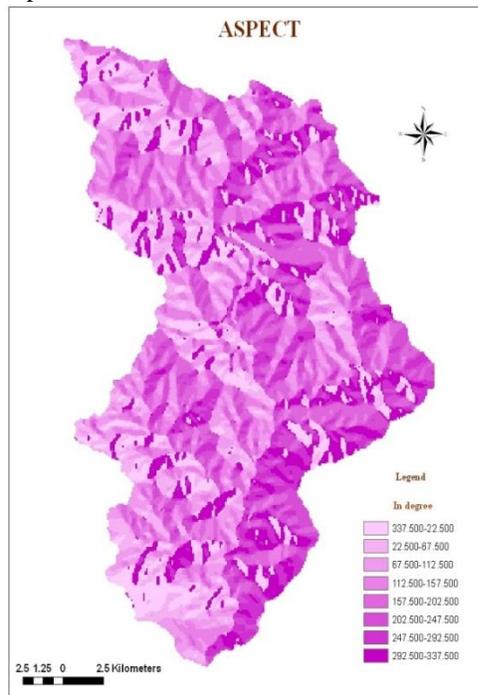


Fig:6 Aspect Kosi watershed, district Almora.

Drainage Density Flowing water is one of the most significant landforms sculpturing agents and hence a study of the drainage system is essential to complement geomorphic study of the terrain It covers out distinct landforms by degradational and aggradational processes which have different shapes size and slope variations. In the watershed medium drainage density is dominant. Low drainage density is occurring NE, NW and SW portion of the boundary. High drainage density occurs in Syahi Devi,Bhatkoat east reserve forest and small patches situated in the east, west and central part of the study area.

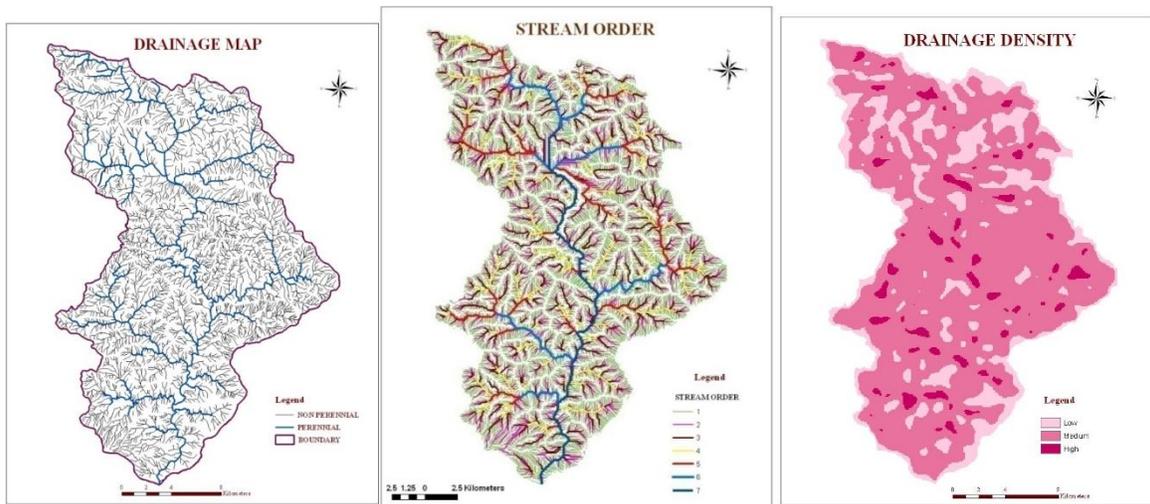


Fig:7 Drainage map, Fig:8 Stream Order, Fig:9 Drainage Density of the Kosi watershed, district Almora. Land use and Land cover

VIII. LAND USE /LAND COVER DISTRIBUTION

The land use/land cover distribution of each study years was derived from the maps are presented in the Table 5. The land use/land cover distribution map of the year 1966 was derived from toposheet (Fig.9 A). In the year 1966 out of total area, Almora urban areas covered by 0.46 per cent. The urban area of Almora is developed in linear pattern along the National Highway 87. Percentage of forest land is maximum. The Forest land is mostly dominated in the N, NE, NW and W parts of the study area. Except only a patch of Sitoli reserve forest is found in the southeastern part, which account for 50.81 per cent of the total area. Barren land covers of 22.59 per cent of total area. Barren land is mainly dominated in the central part and of the study area. Out of total land use, 26.14 per cent is covered by agricultural land. It is mainly found in SW and middle parts of the study areas.

Figure 9B depicts Land use Land cover of 1990. It is derived from Landsat image of Kosi watershed, district Almora. In the year 1990, 28.14 per cent of the area was covered by barren land, which is found in Kantali, Bijoriya, Dhaulara, Aura, Sbil, Bunga, Barasila, Maala, Birlua, Jaal, Rait, Supakot, Babri, Kayrar, Thapaniyaan, Gwalakot, Barsimi villages. These villages are situated in the middle part and west of the study area. In this year agriculture land was 16.11 per cent of the total study area. Agriculture land was found in the Manan, jyala, syura, Chan, devil, lat. Mal and sarsyson villages. These villages are situated in the middle, and central part of the boundary. Present forest land covered the 55.23 per cent of the study area. The main forest areas are Syahi Devi, Sitoli, and Bhatkoat East, Ganenath reserve forest. These reserve forest are dense reserve forest. A small part, i.e., 0.51 per cent area covered by the Almora urban area. Fig:9C depicts Land use/Land cover of the year 1999. It is derived from Landsat image of Kosi watershed, district Almora. In the year 1999 about 55.87 per cent area was covered by forest land. Forest land was found in the North, NE, NW, W, E and SW parts of the study area. In this year 29.44 per cent covered study area by barren land, which is found in the namely Kantali, Royanmath, Kophari, Lwosal, Dhulara, Sbil, Birlauwa, Jaal, Rait, Dungarkot, Doyaari Chack, Rabari, Hatyura, Bharargaon and Sakeri villages. These villages are middle and west portion of the study area. Agriculture land covered of 14.12 per cent of the total study area. Raulanya, Chhani, Tola, Bheta, Chanali, Balauta, Dungariharawaal, Bhagtola, Manan and Pachgaon, are villages where agriculture land falls. 0.67 per cent area covered by Almora urban area. Figure 9D depicts Land use/Land cover distribution of 2004. It is based on LISS III image of Kosi watershed, district Almora. In the year 2004 forest covers was found in 55.22 percent area. About 30.24 per cent area was barren land. About 13.74 per cent area was Agriculture land. Almora urban area was covered by 0.80 per cent area.

Land use land Cover categories	1966		1990		1999		2004	
	Area in (sq km)	Area in (%)	Area in (sq km)	Area in (%)	Area in (sq km)	Area in (%)	Area in (sq km)	Area in (%)
Forest	235.165	50.81	255.6295	55.23	258.6188	55.87	255.6011	55.22
Barren Land	104.595	22.59	130.2653	28.14	135.8335	29.44	139.9678	30.24
Agriculture Land	120.984	26.14	74.6176	16.12	65.3398	14.12	63.7404	13.74
Urban Areas	2.066	0.46	2.2996	0.51	3.0199	0.67	3.5027	0.80

Table 5: Area under different Land use/Land cover area categories of the Kosi Watershed, district Almora.

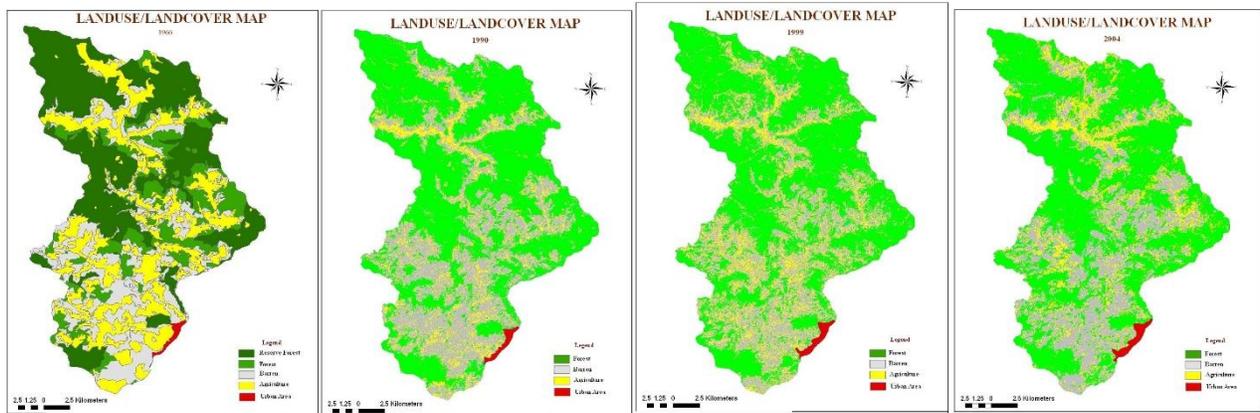


Fig: 9 A Land use/Land covers maps of the Kosi Watershed, district Almora: 1966 (based on SOI Toposheet), **Fig: 9 B** Year 1990 (based on Landsat Thematic Mapper), **Fig: 9 C** Year1999 (based on Landsat Enhance Thematic Mapper) and **Fig: 9 D** Year 2004 (based on LISS)

IX. GIS OF DEVELOPMENT INFRASTRUCTURE

GIS of Education Centers

A depicts the distribution of education centers within the study area. Table 6 shows the numbers of different types of education centers of the Kosi Watershed, district Almora. In this watershed mainly two development block is situated namely Hawalbagh and Takula development block. Maximum education centers situated in the Hawalbagh development block. Hotel Management Institute and University campus are situated in the Hawalbagh development block. Higher Secondary Government Girls School is situated in the Someshwar of the Takula development block.

Government Girls Inter College is situated in the Almora urban area.

Name of Education Centers	Number of Education Centers
Higher Secondary Government girls School	1
Government Girls Inter College	1
Higher Secondary Government School	11
Government Inter College	9
Hotel management Institute	1
University Campus	1
Private Degree College	1

Table 6: Number of different types of education centers of the Kosi Watershed, district Almora

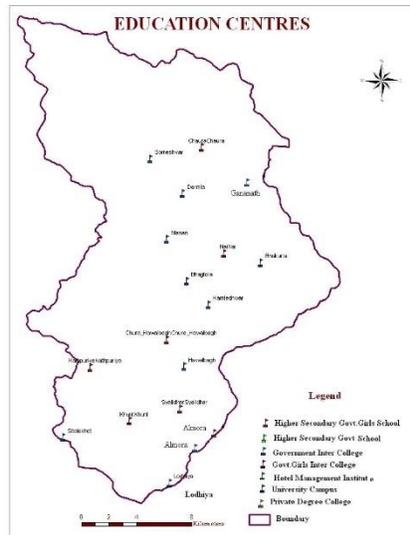


Fig:10 Education Centres of Kosi watershed, district Almora.

GIS of Health Centers

There are numbers of hospitals are available in this watershed. One Base hospital is situated in the Khatyari village of Hawalbagh development block. One Primary health centre is situated in the Hawalbagh village of Hawalbagh development block. Additional primary health centers are situated in Dhamas, Daulaghat, and Someshwar respectively. Table 7 shows the numbers of different types of health centers of the Kosi Watershed, district Almora. Figure 11 depicts the distribution of villages, of the Kosi Watershed, district Almora. Maximum villages are situated in the central part of the boundary.

Name Of Health Centre	Number of Health Centre
Base hospital Almora	1
Primary health Centre	1
Additional primary Health Centre	3
Homeopathic hospital	1
Aryvedic hospital	5

Table 7: Number of different types of health centers of the Kosi Watershed, district Almora

6.3 GIS of Roads

In this Watershed total road length is 221.65 km. Figure 12 depicts the distribution of road network in the Kosi Watershed, district Almora. National Highway 87 E connects the Quarb to Kathpuriya of this Watershed. The Almora urban area is developing along the National Highway. All these roads of this Watershed meet the around the Almora urban areas. Table 8 lengths of different types of roads of the Kosi Watershed, district Almora.

Road Name	Road Length in km.
National Highway	33.16
Other roads	188.65

Table 8: Lengths of different types roads of the Kosi Watershed, district Almora

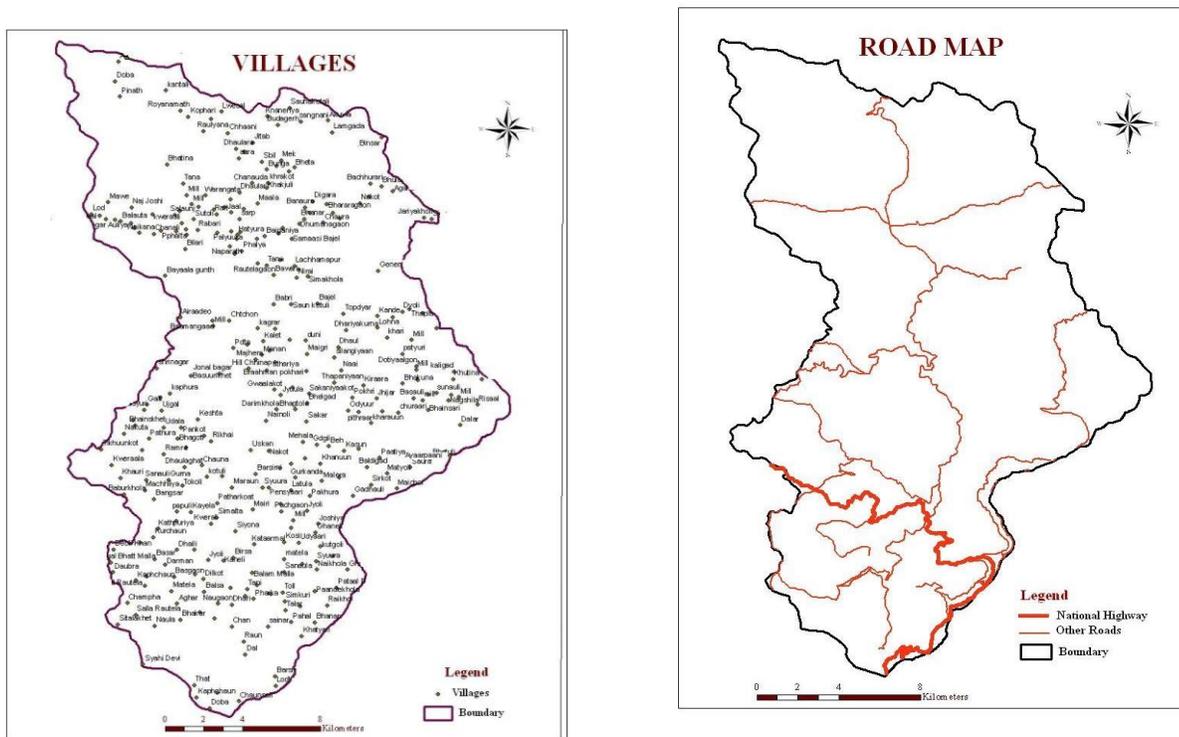


Fig.11 Spatial Distribution of villages and Fig:12 and Road map of the Kosi, Watershed, district Almora.

X. CONCLUSIONS

The fundamental objective of the present study is to create a model of Watershed GIS, which could be used for the stakeholders of the local level planning. Encompassing an area of 462.812 km², the study area viz, the Kosi Watershed was used a natural laboratory the develop Watershed GIS. The Kosi Watershed stretches between 29° 33' 47" to 29° 52' 20" Latitudes and 79° 33' 12" E to 79° 48' 11" Longitudes and lies in district Almora of the Kumaun Himalaya (Uttarakhand).

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Comparison Of Oral Alprazolam 0.25 Mg With Alprazolam 0.5 Mg As Preoperative Anti-Anxiety In Patients Undergo Elective Surgery At Haji Adam Malik General Hospital Medan

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DOI: 10.29322/IJSRP.10.09.2020.p10506

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10506>

Abstract- Background: Anxiety will affect the body's response to release catecholamines so that it can result in an increase in heart rate, contraction of the heart muscle, arterial vasoconstriction, increase in blood sugar levels and others; these conditions can aggravate the condition before entering the operating room.

Objective: This study aims to determine the comparison of the administration of 0.25 mg alprazolam tablets with 0.5 mg alprazolam as a preoperative anti anxiety in patients undergoing elective surgery using the Hamilton Anxiety Rating Scale (HARS) in Haji Adam Malik General Hospital Medan.

Method: This research is a double-blind experimental research. The study was conducted in the Haji Adam Malik General Hospital Medan from February-April 2020. The total sample obtained was 60, of which 30 samples were given Alprazolam 0.25 mg, while the other 30 samples were given Alprazolam 0.5 mg. Previously, the level of anxiety was measured based on the Hamilton Anxiety Rating Scale (HARS) of patients who were included in the sample were patients with moderate and severe anxiety level and re-assessed the level of anxiety after 10 hours of alprazolam administration using Hamilton Anxiety Rating Scale (HARS). Data collection was carried out using questionnaires.

Results: The level of anxiety after administration of alprazolam which was assessed based on the Hamilton Anxiety Rating Scale (HARS) in the group given Alprazolam 0.25 mg and 0.5 mg statistically, no significant difference was found in reducing the level of anxiety.

Conclusion: Comparison between Alprazolam 0.25 mg with 0.5 mg gives the result that the value of anxiety is equally decreased in the administration of alprazolam 0.25 mg and 0.5 mg but there is no statistically significant difference either in the administration of alprazolam 0.25 mg or 0.5 mg.

Index Terms- Hamilton Anxiety Rating Scale, Alprazolam , Anxietas

I. INTRODUCTION

Anxiety is a feeling of uncertain, helplessness, isolated, and insecurity. This emotional state has no specific object.¹ Surgery is a treatment procedure that uses an invasive method. The surgical phases consist of the preoperative, intraoperative and postoperative phase. The preoperative phase in surgery is the initial phase of surgical process. This initial phase begins when the decision is made for surgical intervention and ends when the patient arrive at the operating table.²

The situation before entering the operating room can provide discomfort and anxiety which affects the patient's mental state. This will affect body's response to release catecholamine so that it can lead to an increase in heart rate, contraction of the heart muscle, vasoconstriction of the arteries, increased blood sugar levels and others; this condition can aggravate the condition before entering the operating room.²

Most of the patients who waiting for elective surgery have anxiety. The incidence of preoperative anxiety has been estimated to vary from 11% to 80% in adults. Research in 2007 on the preoperative anxiety level showed that out of 40 respondents there were 16 people or 40% who had an anxiety level in the moderate category, 15 people or 37.5% in the mild category, respondents with a severe anxiety level were 7 people or 17, 5% and respondents who did not feel anxious were 2 people or 5%.³

Anxiety can cause elevated in catecholamine level leading to tachycardia, hypertension and hemodynamic instability, arrhythmias and high pain thresholds and persist into the postoperative period. A reliable biological indicator for an anxiety reaction is a valuable marker in psycho-physiological research and clinical practice.⁴

Patients are often given several anxiolytic drugs before surgery to prevent anxiety. Prevention of preoperative anxiety with anxiolytic premedication improves surgical outcomes and decreases hospitalizations in surgical patients. To reduce the level of anxiety is done by administering drugs from the benzodiazepine group. Benzodiazepines produce pharmacological effects by facilitating the action of gamma amino butyric acid (GABA), an inhibitory neurotransmitter in the central nervous system. The properties of benzodiazepines can be in the form of sedation,

anxiolytics, antidepressants, and hypnotics. Benzodiazepines include diazepam, alprazolam, lorazepam, midazolam, clonazepam, diazepam, and oxazepam.⁵

Anxiety can be measured by measuring the anxiety level according to an anxiety measurement tool called the HARS (Hamilton Anxiety Rating Scale). The HARS scale is a measure of anxiety based on the appearance of symptoms in individuals experiencing anxiety. According to the HARS scale, there are 14 symptoms that appear in individuals who experience anxiety. Each item that is observed is given 5 levels of score (Likert scale) between 0 (Zero Present) to 4 (severe). The HARS scale was first used in 1959, which was introduced by Max Hamilton and has now become the standard in measuring anxiety, especially in clinical trial studies. The HARS scale has been proven to have high enough validity and reliability to measure Anxieties in clinical trial studies, namely 0.93 and 0.97. This condition indicates that measurement.⁶

Based on the literature study and related research results and also considering the level of anxiety, side effects and drug availability, so that in this study the administration of alprazolam 0.25 mg and alprazolam 0.5 mg orally as a premedication drug was to assess the level of anxiety during premedication in patients who were going to undergo elective surgery before entering the operating room using the HARS scale.

II. METHODS

This study is an analytic study with experimental design carried out at Haji Adam Malik General Hospital Medan.

4.1 Demographic Data Table

Characteristic	Group A	Group B	Total	P value
	Alprazolam 0,25 mg n	Alprazolam 0,5 mg n		
Gender, n (%)				
Man	13 (43,3)	14 (46,7)	27 (45)	0,797
Woman	17 (56,7)	16 (53,3)	33 (55)	
Age, Mean (SD)	40,0 ± 7,9	34,4 ± 13,1	37,2 ± 10,9	0,436
Religion, n (%)				
Muslim	13 (43,3)	19 (63,3)	32 (53)	0,124
Christian	17 (56,7)	11 (36,7)	28 (47)	
Ethnic, n (%)				
Batak	17 (56,7)	17 (56,7)	34 (57)	0,946
Malay	11 (36,7)	10 (33,3)	21 (35)	
Minang	1 (3,3)	2 (6,7)	3 (5)	
Javanese	1 (3,3)	1 (3,3)	2 (3)	
Education, n (%)				
Bachelor	6 (20,0)	9 (30,0)	15 (25,0)	0,529

Consecutive sampling is a sample selection technique by which all subjects who come and meet the selection criteria are included in the study until the number of subjects is met. After obtaining approval from the Ethics Committee, Faculty of Medicine, University of North Sumatra, based on inclusion and exclusion criteria 60 research samples were collected. The population sampled was divided randomly into 2 groups, namely group A received Alprazolam 0.25 mg and group B received Alprazolam 0.5 mg by using the double blind method. One day before, surgery schedule was seen for the next day and all possible patients to be sampled were checked whether they met the inclusion criteria or not, after being assigned the patients were randomly randomized and determined whether they were group A or group B. The drug that had been prepared by one volunteer was given to volunteer 2 to be given to patients at night according to their group. After 10 hours of drug administration, patients will be assessed for anxiety levels by pre-trained participants according to the HARS scale.

III. RESULTS

This study was attended by 60 subjects who met the inclusion criteria. The characteristics of this study were displayed based on gender, age, religion, ethnic, education, and PS ASA.

SMA	18 (60,0)	18 (60,0)	36 (60,0)	
SMP	3 (10,0)	3 (10,0)	6 (10,0)	
SD	3 (10,0)	0 (0)	3 (5,0)	
PS ASA				
I	11 (36,7)	14 (46,7)	25 (42)	0.436
II	19 (63,3)	16 (53,3)	35 (58)	

*Mann-Whitney test

Table 4.1 shows the distribution of social and clinical characteristics in this study, with a mean patient age of 37.2 ± 10.9 years. Most of the patients were female with a percentage of 55.0%. Most patients were Muslim with a percentage of 53.0%, with the highest ethnic group being Batak, namely 57.0%. Most patients were with high school education, namely 60.0% and with the highest PS ASA II status at 58.0%. The samples in this study were entirely planned for elective surgery regardless of the

anesthesia technique whether general anesthesia or regional anesthesia. From the results of the table after being entered into SPSS, the results obtained for the P value for gender $P = 0.797$, for age $P = 436$, religion $P = 0.124$, ethnicity $P = 0.946$, education $P = 0.529$, and PS ASA obtained P value = 0.436. It can be concluded that the patients in this study were relatively homogeneous ($p > 0.05$).

4.2 Comparison of anxiety levels in patients before treatment

HARS before treatment	Group				Total		P value
	Alprazolam 0,25 mg		Alprazolam 0,5 mg		n	(%)	
	N	(%)	N	(%)	n	(%)	
Mild anxiety	0	0	0	0	0	0	
Moderate anxiety	18	60	17	56,7	35	58,3	0,795
Severe anxiety	12	40	13	43,3	25	41,7	

*Mann-Whitney test

Based on the table 4.2, subjects with mild anxiety levels were not included in this study, the group receiving alprazolam 0.25 mg was 18 people (60%), the group receiving Alprazolam 0.5 mg with The level of severe anxiety was 17 people (56.7%). While subjects with severe anxiety levels in the group receiving alprazolam 0.25 mg were 12 people (40%), the group receiving alprazolam 0.5 mg with severe anxiety levels was 13 people

(43.3%). The total number of patients with moderate anxiety levels in this study was 35 people (58.3%) and the total number of patients with moderate anxiety levels in this study was 25 people (41.7%). From the results of the table after being entered into the SPSS, the p value was 0.795 which can be concluded that the patients in this study were relatively homogeneous ($p > 0.05$).

4.3 Comparison of anxiety levels in patients after treatment

HARS after treatment	Group				Total		P value
	Alprazolam 0,25 mg		Alprazolam 0,5 mg		n	(%)	
	n	(%)	N	(%)	n	(%)	
Mild anxiety	18	60	18	60	36	60	
Moderate anxiety	9	30	12	40	21	35	0,757
Severe anxiety	3	10	0	0	3	5	

*Mann-Whitney test

Based on the table 4.3, there were 18 people (60%) with mild anxiety levels in patients after 10 hours administration of alprazolam 0.25 mg and the group that received Alprazolam 0.5 mg with mild anxietas levels were 18 people (60%). Subjects with moderate anxiety levels in the group receiving alprazolam 0.25 mg were 9 people (30%), while the group receiving Alprazolam 0.5 mg with moderate anxietas was 12 people (40%). While the subjects with severe anxiety levels in the group receiving alprazolam 0.25 mg were 3 people (10%) and the group receiving alprazolam 0.5 mg with severe anxiety levels was not found (0%).

The total number of patients with mild anxiety levels was 36 (60%), 21 patients (35%) had moderate anxiety levels, and the total patients with severe anxiety levels in this study were as many as 0.25 mg of alprazolam. 3 people (5%). From the results of the table after being entered into the SPSS, the p value was 0.757 which can be concluded that the patients in this study were relatively insignificant ($p > 0.05$).

IV. CONCLUSIONS

There was no significant difference in the administration of alprazolam 0.25 mg or 0.5 mg in reducing the level of anxiety in patients undergoing elective surgery.

There was a decrease in anxiety levels in patients receiving alprazolam 0.25 mg using HARS scoring in patients undergoing elective surgery.

There was a decrease in anxiety levels in patients receiving alprazolam 0.5 mg using HARS scoring in patients undergoing elective surgery.

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Causal Relationship between Macroeconomic Indicators and Stock Market: Evidence from Sri Lanka

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DOI: 10.29322/IJSRP.10.09.2020.p10507
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10507>

Abstract-Researchers, economists, investors, and policymakers attempt to identify and estimate the nexus between share market indices with macroeconomic factors. The aim of this study is to analyze the impacts of some prominent macroeconomic factors on the main share market index in Sri Lanka, ASPI (All Share Price Index) over the period 2010 January to 2020 May. Selected independent variables were All Share Price Index, Exchange Rate, Money Supply, Consumer Price Index, Brent Crude Oil, Bitcoin and Trade Balance. The study investigated the interrelationship between ASPI and other variables using Granger causality test. The findings suggest that, Stock market Granger-causes exchange rate, trade balance and is therefore leading indicator of these variables whereas money supply and stock prices is Granger causality in both directions. Other variables seem to be independent on development of the stock market.

Index Terms -Granger-causality, Global indices, Macroeconomics variables, ASPI, Sri Lanka

I. INTRODUCTION

Stock market plays a vital part of the economy of a country. For any instability or even simple changes of the economy causes to fluctuate the stock market indices suddenly. However, it is somewhat difficult to identify specific factors that influence the stock market as completely. Fluctuation of the stock market might be affected directly or indirectly or even different time period due to economics, political affairs, natural disasters, man-made disasters and market psychology and those factors could not limit to one aspect.

Stock market performance leads economic activity is now becoming very controversial in the countries in the world and has gained much attraction in the last few months due to spreading of Covid19 virus throughout the world. Almost all the indicators such as market capitalization, trading volume, total turnover and the market index have shown tremendous collapse.

Macroeconomic factors like interest rate, inflation, production often leads stock markets fluctuations. Sri Lanka has an experience of fluctuation of stock market due to the political changes. The presence of political incidents is a worldwide phenomenon that has affected most national stock markets (Ziobrowski, Peng Cheng, James, & Brigitte, 2004).

The relationship between stock market returns and a range of macroeconomic and financial variables with the large number of different stock markets could be observed in the literature. However, most of the studies do not consider the relationship between stock indices with the all internally and externally affected factors. This study investigates and analyses the interaction between selected foreign and local determinants with stock market index in Sri Lanka with the updated data.

The remainder of the paper is organized as follows: Section 2 briefly depicts and reviews existing literature on the nexus between stock price and macro-economic variables, section 3 explains the data and methodology; Section 4 analyses the empirical results and the final section is presented conclusion.

II. LITERATURE REVIEW

The relationship between stock markets and macroeconomic forces has been widely debated in the finance and macroeconomic literature. Large number of studies have focused to link the macroeconomic variables and stock market. Out of them some are aimed to analysis with market indices and some are focused to stock return. (Pal & Mittal, 2011)observed relationship (long run) between two Indian capital markets and some macroeconomic variables (interest rates, inflation, and exchange rate and gross domestic savings) with quartile data from January 1995 to December 2008 utilizing unit root test, co-integration and error correction mechanism. Inflation rate have the significant impact on both capital markets whereas interest rate and foreign exchange rate have the impact on one capital market were the findings.

(Andreas & Macmillan, 2009) conducted an analysis for comparison of US and Japan. The study has suggested that for the US, there is a positive relationship between stock prices and industrial production while interest rate and consumer price index are negatively associated with stock prices further for Japan, their findings showed that stock prices are negatively related to industrial production and negatively related to money supply. Theoretically, change in exchange rate affects the global performances of the firms which will affect their share prices. stated that exchange rate has positive effect on stock returns according to (Abdalla & Murinde, 1997). Foreign exchange and equity market returns should be negatively correlated because of portfolio rebalancing (Hau & Rey , 2006) According to (Nesrine, Hamad, Christian, & Sahar, 2018) exchange rate volatility has a significant effect on stock market fluctuations adopting a Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model.

Impact of stock markets, exchange rates and oil price on Bitcoin price were observed by (Vank Wijk, 2013). Findings was that in the long run, the Dow Jones Index, the euro–dollar exchange rate and oil price have a significant impact on the value of Bitcoin. However, it is difficult to identify the direct relationship between changing of Bitcoin prices with stock market performances (Erads & Caglar , 2018). (Degiannakis, Filis, & Kizys, 2014) investigated the impacts of oil price shocks on stock markets in Europe over the 1999–2010 period. The findings obtained from a structural vector autoregressive model suggested that increases in oil prices significantly affect the demand side of economies, which finally cause a negative effect on stock markets. They stressed that oil price is a good indicator on predicting stock market volatility. (Pilinkus & Boguslauskas, 2009) analyzed the short-run relationships between macroeconomic variables and the stock market index in Lithuania over the 2000–2009 period. Their findings suggested that increases in GDP and money supply raise the stock market index while increases in unemployment, exchange and interest rates reduced the index value.

(Rashid , 2008) concluded that co-integration between the stock prices and macroeconomic variables with consumer prices, industrial production, exchange rate and the market rate of interest. Further of this study estimated in the long run there is bi directional causation between the stock prices and macroeconomic variables where as in short run, the stock prices are Granger-caused by changes in interest rates.

III. DATA AND METHODOLOGY

Variables

For the analysis, data were gathered mainly stock market index named as All Share Price Index (ASPI) measured by the movement of share prices of all listed companies which based on market capitalisation and trading on the Colombo Stock Exchange. Base values are established with average market value on year 1985.

Table 1 Description of variables

Variable	Label	Variable	Label
Financial Innovation	FI	Land & Property	L&P
Banks, Finance & Insurance	BFI	Manufacturing	MFG
Beverage, Food & Tobacco	BFT	Motors	MRT
Construction & Engineering	C&P	Oil Palms	OIL
Chemicals & Pharmaceuticals	C&E	Power & Energy	PLT
Diversified	DIV	Plantations	P&E
Footwear & Textiles	F&T	Stores & Supplies	SRV
Hotels & Travels	HLT	Services	S&S
Healthcare	H&T	Telecommunication	TEL
Investment Trusts	INV	Trading	TRD
Information Technology	IT		

Source: Central bank of Sri Lanka, Colombo Stock Exchange

Above table presenting the listed all investigated variables. USD to Sri Lankan (LKR) rupees monthly exchange value is considered as EX variable. Money supply denoted as total money stock that circulates among the general public at a given period and here considered M2 which includes

notes and coins with the public, deposits of public with commercial banks and time and savings deposits of the public with commercial banks as Million rupees. CPI is an index which is calculated considering the change in the cost to the average consumer of acquiring a basket of goods and service. As a global index Brent crude oil exchange price (USD) per barrel and Bitcoin price were considered. Trade balance of a country normally obtain the difference between export and important and normally Sri Lanka having practices of negative values of its. The data on all the variables are collected on monthly basis for the period from January 2010 to May 2020.

Methodology

In order to check the interaction between FI and the selected sector specific variables, as a first step it is mandatory to determine whether the data is stationary or not. In this analysis the most popular and widely used test for the unit root is Augmented Dickey–Fuller test (ADF) (Dickey & Fuller, 1979), has utilized.

As a second step, create bivariate VAR models for data in levels and determine appropriate lag length p . The most common approach for model order selection involves selecting a model order that minimizes one or more information criteria evaluated over a range of model orders is Akaike Information Criterion (AIC) :

$$AIC = 2k - 2\ln(L)$$

Here L is the maximum value of the likelihood function for the model and k is the number of estimated parameters in model. The decision for the best model is one with the minimum AIC value.

Next step is testing co-integration to see possible presence of integration using Johansen's methodology, takes its starting point in the vector auto regression (VAR) of order p given by

$$y_t = \mu + A_1 y_{t-1} + \dots + A_p y_{t-p} + \varepsilon_t$$

where y_t is an $n \times 1$ vector of variables that are integrated of order one – commonly denoted $I(1)$ – and ε_t is an $n \times 1$ vector. If two time series are integrated, then there must exist Granger causality between them in any direction or in both directions

Last step is to apply (Toda & Yamamoto, 1995) approach for testing Granger causality. If the data in level with lag length $p + m$, it requires creating bivariate VAR models. Here p is the number of lags found in VAR model following AIC and m represents maximal order of integration of variables in the process. Granger causality test is a technique for determining whether one time series is significant in forecasting another (Granger, 1969)

$$Y_t = a_0 + \sum_{t=1}^{p+m} a_t Y_{t-1} + \sum_{t=1}^{p+m} b_t X_{t-1} + \varepsilon_{t1}$$

$$X_t = c_0 + \sum_{t=1}^{p+m} c_t X_{t-1} + \sum_{t=1}^{p+m} d_t Y_{t-1} + \varepsilon_{t2}$$

In this case variable Y is Granger caused by variable X if variable X assists in predicting the value of variable Y . If this is the case, it means that the lagged values of variable X are statistically significant in explaining variable Y . It can be tested using Wald test statistics. When the null hypothesis that X does not Granger-cause Y :

$$H_{nul}; \sum_{t=1}^p b_t = 0 \quad vs \quad H_{all}; \sum_{t=1}^p b_t \neq 0$$

And when Y does not have Granger-cause X ;

$$H_{nul}; \sum_{t=1}^p d_t = 0 \quad vs \quad H_{all}; \sum_{t=1}^p d_t \neq 0$$

IV. RESULTS

Figure 1 presented that the distribution of all variable according to the selected time period. All of the above visual inspection suggests that the variables in levels do not have constant mean. Further, it is illustrated that all the time series plots are not stationary and showing the pattern of trend and fluctuations along with time. Variable ER, CPI, M2 and BT are presented increasing trend whereas BO and TB showed negative trend.

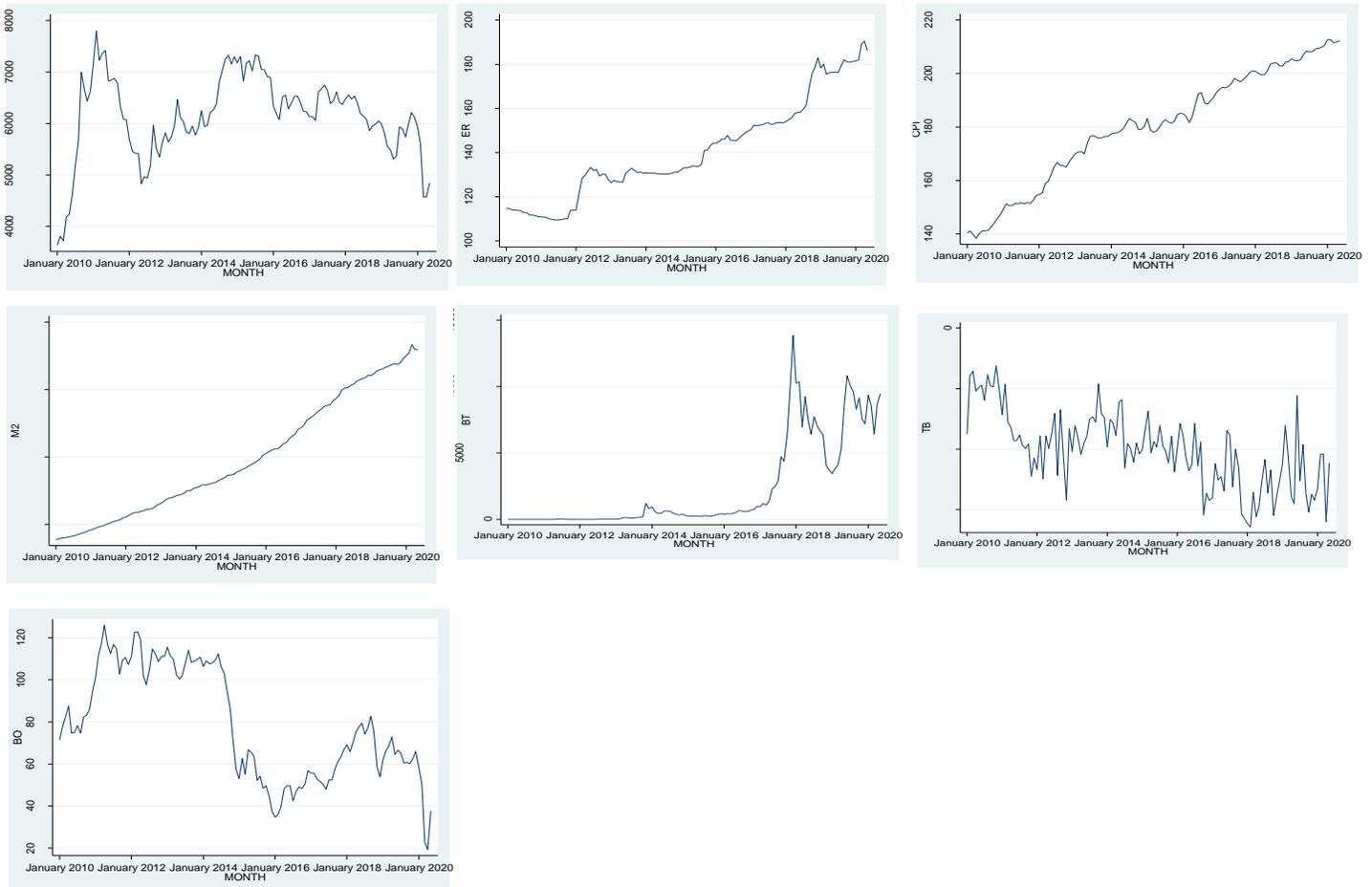


Figure 1: Time series plot for all variables

Table 2 descriptive statistics for the variables

Variable	Mean	SD	Minimum	Median	Maximum
ASPI	6146.6	803.4	3636.4	6194.6	7798
ER	140.93	22.52	109.45	133.26	190.5
M2	3971059	1755168	1551744	3553629	7335948
CPI	180.04	21.35	138.4	181.6	212.7
BT	2303	3473	0.1	416	13850
BO	78.57	26.66	19.33	74.64	125.89
IM	224815	53989	111494	218424	329465
EX	124221	31910	53721	119857	202850

Source: Author’s own calculation

Mean, standard deviation, minimum medium and maximum value foe the monthly data for the period of 2010 January to 2020 May presented in table 2.

Table 3: Results of ADF test

Variable	Data in level		Data in first difference	
	t-statistics	P-value	t-statistics	P-value
ASPI	-2.883	0.168	-10.182	0.00
ER	-1.933	0.638	-8.333	0.00
M2	-1.832	0.689	-11.171	0.00
CPI	-2.076	0.559	-8.401	0.00
BT	-2.468	0.344	-10.976	0.00
BO	-2.362	0.400	-8.59	0.00
TB	-7.529	0.000	-18.315	0.00

Source: Author’s own calculation

Unit root in data in level and data in first difference under the ADF test are presented in table 3. Except TB variable other all variables are not stationary and it is clearly showed that the null hypothesis of the existence of unit root is rejected at 5% significance level for the first difference data. Finally results are suggested that time series are characterized as I(1).

Table 4: Results of Lag selection

VAR Model	Lag	AIC	P value
ASPI«ER	1	18.245	0.00
ASPI«M2	1	38.176	0.000
ASPI«CPI	4	17.465	0.001
ASPI«BT	1	30.8908	0.00
ASPI«BO	2	20.765	0.023
ASPI«TB	3	37.037	0.089

Source: Author’s own calculation

Selecting optimal lag length using VAR model with constant association are presented in Table 4 according to Akaike Information Criterion (AIC) for every model. Presence of serial correlation of the residuals are tested with this analysis.

Table 5. Result of Johansen’s cointegration tests

Rank	Variable						Critical value
	ER	M2	CPI	BT	BO	TB	
$r = 0$	13.417	21.496	13.305	13.297	12.559	29.058	15.41
$r \leq 1$	0.0441	1.171	0.530	0.8137	2.39	8.462	3.76

Source: Author’s own calculation

Under the result of ADF has suggested that all the variables are characterized by I(1). For the multiple individual time series found to be integrated of order one, then another test used to determine whether long-term relationship exist among the variables, an additional test is required to determine whether long-term relationships exist among the variables. Table 5 presented the results for Johansen test between ASPI and all other six variables. According to the results, possible cointegration occurs between ASPI with M2 and ASPI with TB. It is that there is an evidence to reject null hypothesis of no cointegrating vectors ($r=0$) on significance level 5 % and accept the alternative of one or more integrating vectors. The presence of cointegration between stock market prices and selected macroeconomic variables provide firm evidence that there exists an interactive relation between them. If we discover some sort of this relationship in bivariate analysis, there inevitably exists a causal relationship at least in one direction.

Final step of the analysis is to test the Granger causality with the help of Wald test statistics. According to the results of Table 6 there is an evidence to reject null hypothesis by giving the conclusion that Granger causality from ASPI to Exchange Rate at the 5% significance level. Results showed that next important relationship between ASPI and broad money supply (M2) because that variable has Granger causality in both directions at the around 5 % significance level. There is one direct Granger causality from ASPI to Trade Balance and its significant at the 5% significant.

Table 6: Results of bivariate Granger Causality

Null hypothesis	Lags	Test statistics	P-value
ASPI does not cause ER	1	0.762	0.3843
ER does not cause ASPI	1	3.8766	0.051
ASPI does not cause M2	1	5.6723	0.0188
M2 does not cause ASPI	1	3.438	0.066
ASPI does not cause CPI	4	1.027	0.396
CPI does not cause ASPI	4	1.449	0.222
ASPI does not cause BT	1	0.393	0.532
BT does not cause ASPI	1	1.746	0.189
ASPI does not cause BO	2	0.878	0.418
BO does not cause ASPI	2	0.037	0.963
ASPI does not cause TB	3	0.656	0.581
TB does not cause ASPI	3	3.299	0.023

Source: Author's own calculation

V. CONCLUSION

This paper is to explore the impact of different macroeconomic and global variables on the stock market in Sri Lanka using Granger causality approach. For the analysis, exchange rate, money supply, Consumer Price Index, Bitcoins, Brent oil and trade balance with All Share Price Index are considered for all monthly data from January 2010 to May 2020. According to Johansen cointegration test, it is concluded that there is cointegration between ASPI with exchange rate, Consumer Price Index, Bitcoins and Brent oil in Sri Lanka. Further finding bivariate causal relationship using Granger causality, there is a relationship with ASPI and exchange rate. So exchange rate may be the one of leading factors for the stock index in Sri Lanka. The next important bi-directional Granger causality emerged between stock market and money supply and also it further shown on theoretical and empirical evidence. The final significant relationship with ASPI occurs in trade balance. Depending on the import and export variables, investors can take their decision on stock market investment and trade balance may be the one of leading factor. However, other variables in the analysis of stock market relationship are independent.

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Feasibility Study of a 100MW Photovoltaic Power plant at Bati, Ethiopia Using RETScreen.

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DOI: 10.29322/IJSRP.10.09.2020.p10508

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10508>

Abstract- Today, world is looking for alternate energy sources as the gross effect of GHG is disturbing the nature balance. Ethiopia is a country with an aggressive plan to solely depend on clean Energy. This paper is about feasibility study of a 100MW PV power plant at Bati, Ethiopia. For the study RETScreen software is used, Using the RETScreen the benchmark analysis, emission analysis and financial analysis were made. From the bench mark analysis the energy cost of production is reduced to 1.6 ETB/KWh. The emission analysis shows that 2365.3 tCO₂ will be reduced from the potential emission to the environment and finally from financial analysis the NPV and the cumulative cash flow shows positive results. Hence, this means the project is feasible financially, technically and environmentally and it will help the country to achieve its goal in building clean energy

Key Words: Photovoltaics, Power Plant, RETScreen, Feasibility, NPV

Index Terms- Feasibility, NPV, Photovoltaics, Powerplant, RETScreen

I. INTRODUCTION

P. Chauhan and his friend said that: Because of the daily growing demand for energy we have to find the more and new alternatives of energy to satisfy the demand. And they also outlined solar power as one of the most common sources of energy and its production over other energy sources rising globally[1] I. Elsayed and his friend strengthen the above idea believing that the utilization of renewable and sustainable energy is nowadays attracting more attention due to the serious energy crisis together with the global appeal for a sustainable future[2] L. Aguilar said that: in the recent decade the world has seen consistent growth in solar power, a renewable and environmentally friendly energy resource, due to its versatility and advances in solar cell development allowing for the technology to become more readily available in different contexts and applications worldwide[3]. E. Al-Ammar and his friend mentioned that PV power plants have been built the world over, and successfully proven as one of the important substitutes of alternative energy[4]

According to E. Gordon, less than a quarter of East Africa's population has access to electricity, the lowest electrification rates in the world. E. Gordon, explained that, this, combined with the region's vast natural resources, represent a major opportunity for renewable energy investors. Solar irradiation levels are high due to proximity to the equator, wind speeds are some of the strongest on the continent, hydropower resources are plentiful, and the Great Rift Valley is a promising source for geothermal power[5]. It has been said that the increase in energy consumption has led to global environmental issues including climate change. The importance of transition to a low carbon society has been widely recognized internationally. The global actions are essential to countries on those issues have been increasing in a drastic manner. The importance of transition to a low carbon society has been widely recognized internationally. The global actions are essential to achieve the goal of low carbon society with sustainable energy supply. low carbon society has been widely recognized internationally [6]. Ethiopia is one of the fast-developing country located in the horn of Africa. According to M. Dorothal, the country boasts an impressive average GDP growth rate between 7 and 10% over the past 3 years, making it the fastest growing economy in the region with one of the highest GDP growth rates in Africa[7]. According to GTP II Major emphasis is given to building a climate resilient green economy in the context of sustainable development and realizing the vision of becoming a lower middle-income country by 2025. GTP II further explains that expanding electricity power generation from renewable sources of energy for domestic and regional markets; leap frogging to modern and energy efficient technologies in transport, industry and constructions are the basic strategies of building climate resilient green economy[8].

Ethiopia is endowed with vast renewable energy potential in hydro, solar, wind, and geothermal power and investing significantly in energy infrastructure over the past decade using public-financed and public-executed approaches. N. E. Benti and his friend said that Ethiopia lies in the sunny belt between northern latitudes of 3° and 15°, and thus the potential benefits of renewable energy resources such as solar energy system can be considerable[9]. According to K. Komota and his friends PV power plants with several hundred MW

scale area already in the commercial stage and technically feasible. It may be reasonable to expect that GW-scale PV power plants will come on the market in the near future[10].

II. METHODOLOGY

A. Climate data and Location of the Power Plant

The location of the power plant is at Bati town with Latitude of 11.2°N and Longitude of 40.0°E the other details of the location are given by Table-1. the location is selected based on climate data that can justify its potential through bench mark analysis and the climate data is given by Table-2. The average daily solar radiation-horizontal of Bati is about 5.96kwh/m². Therefore, the Bati town have a very good amount of solar radiation which can be utilized for electric generation. Based on the value obtained from the climate data it is easily understandable that the location is suitable for power production.

Table-1: Climate Data Location and Facility Location

	Unit	Climate data location	Facility location
Name		Ethiopia - Bati	Ethiopia - Bati - Bati
Latitude	'N	11.2	11.2
Longitude	'E	40.0	40.0
Climate zone		1B - Very hot - Dry	1B - Very hot - Dry
Elevation	m	1100	1624

The facility location is with an elevation of 1624 meters above sea level. The climate data is extrapolated to this elevation to perform the exact calculations of the feasibility study and the extrapolated results are given by table-2.

Table-2: Climate Data of the Facility Location

Month	Air temperature	Relative humidity	Precipitation	Daily solar radiation - horizontal	Atmospheric pressure	Wind speed	Earth temperature	Heating degree-days	Cooling degree-days
	°C	%	mm	kWh/m ² /d	kPa	m/s	°C	°C-d	°C-d
January	21.9	49.5%	11.47	5.35	89.3	2.8	24.0	0	369
February	23.2	46.0%	20.16	5.77	89.3	2.9	25.4	0	370
March	24.8	48.4%	55.18	6.19	89.1	2.8	26.8	0	459
April	26.0	50.7%	61.80	6.44	89.1	2.7	27.9	0	480
May	28.1	39.8%	39.37	6.58	89.0	2.7	30.0	0	561
June	29.5	34.5%	43.50	6.17	88.9	2.6	31.6	0	585
July	27.1	52.2%	168.33	5.75	88.9	2.1	28.2	0	530
August	25.8	60.6%	164.30	5.72	89.0	1.9	26.3	0	490
September	25.9	54.5%	75.60	5.96	89.0	2.0	26.7	0	477
October	24.5	44.5%	29.14	6.09	89.2	2.5	25.8	0	450
November	22.8	43.2%	9.90	6.02	89.3	2.7	24.4	0	384
December	21.7	47.6%	13.33	5.51	89.4	2.7	23.5	0	363
Annual	25.1	47.7%	692.08	5.96	89.1	2.5	26.7	0	5,517

B. Power Plant Capacity

According to L.Marena and his friends Ethiopia is currently about to build a 100MW PV power plant in Metehara and the country is working to reach 5,300 MW of power generated from solar by 2030 [11], to reach this amount it is a must to do potential and feasibility assessments to help the government and interested energy sector investors. Therefore, this study will contribute a potential 100MW of power addition to the national grid and it has its own role to help the country to reach its goal by 2030.

C. Software Used

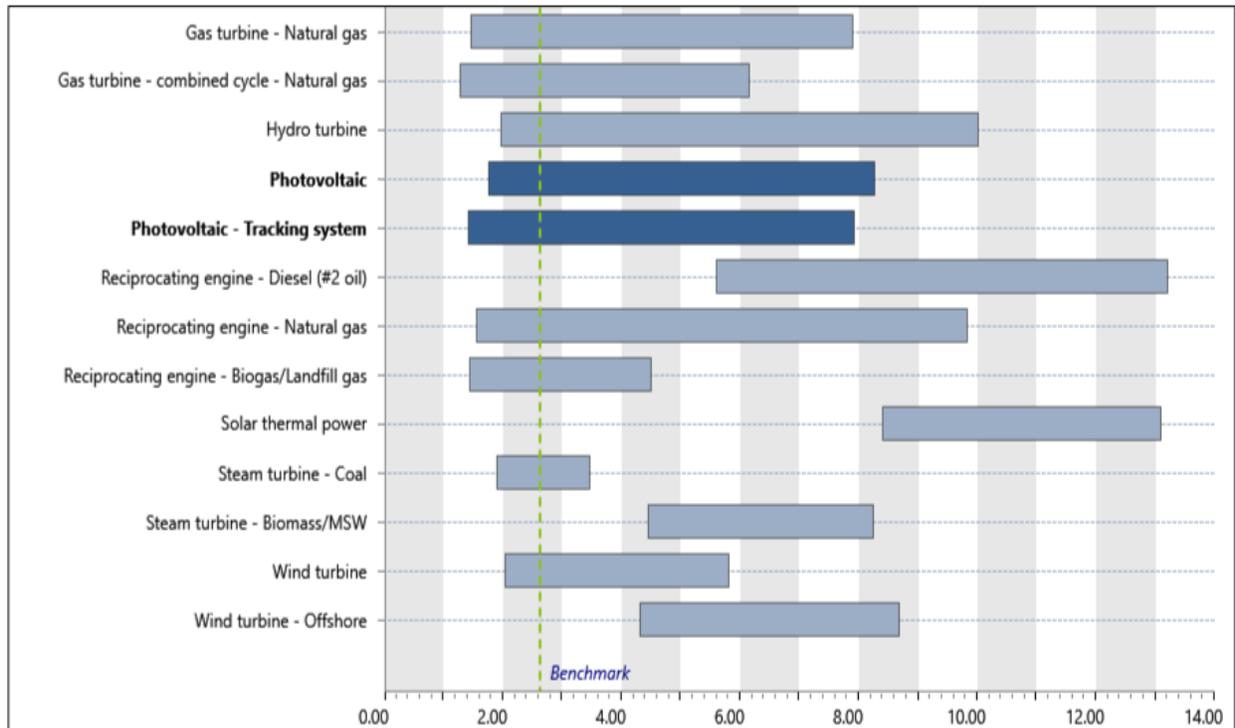
According to [12] RETScreen is a Clean Energy Management Software system for energy efficiency, renewable energy and cogeneration project feasibility analysis as well as ongoing energy performance analysis. Therefore, RETScreen software is used for all the feasibility analysis.

III. Results and Discussions

A. Benchmark Analysis

It has been said that Benchmarking analysis is a specific type of market research that allows organizations to compare their existing performance against others and adopt improvements that fit their overall approach to continuous improvement and culture[13]. And according to[14] the energy cost of production of Ethiopia is 0.09 USD for 1kwh which is 2.61 birr per kwh as per the currency during the analysis (1USD is equivalent to 28 ETB). The bench mark analysis result of this study has been given in fig.1 below.

Energy production cost - Central-grid - Range (ETB/kWh)



Benchmark: 2.61 ETB/kWh

Figure-1: Benchmark Analysis

From the bench mark analysis in Fig. 1 the cost of production for 1kwh photovoltaic power plant is about 1.6 ETB which is much less than the existing power generation options in the country. Therefore, it is clear that photovoltaic powerplant at Bati Ethiopia is feasible regarding the cost of power production and this positive result pushes for further economic analyses.

B. Energy Analysis

The Energy analysis is made based on The bench mark analysis in section 3.1 and the climate data in section 2.1. The target plant capacity is about 100MW, this means the plant should deliver constantly 100MW of power to the national grid. But, from the nature solar radiation intensity it is difficult to get constant power production as the solar radiation intensity is different from hour to hour and day to day. After performing the energy analysis, the maximum capacity of the plant is 135,000Kw and the electricity supplied to the national grid is calculated to be 275,701MWh and this is given by table-3 below.

Table-3: Energy Capacity

Photovoltaic - 100000 kW			
Capacity	135,000	●	kW
Electricity	275,701		MWh

C. Financial Viability

According to [15] financial viability is the ability to generate sufficient income to meet operating payments, debt commitments and, where applicable, to allow for growth, while maintaining service levels. Therefore, in this section the financial viability of the power plant is discussed. for a project to be financially viable the financial parameters are the determining factors. Those financial parameters are given in table:4. Before the financial analysis, it is important to take the proper assumptions of the inflation rate, discount rate, reinvestment rate and project life as this all helps in the financial viability process and the assumptions taken are given in table:4.

Table-4: Financial parameters

General		
Inflation rate	%	2%
Discount rate	%	9%
Reinvestment rate	%	9%
Project life	yr	20
Finance		
Debt ratio	%	70%
Debt	ETB	113,400,000
Equity	ETB	48,600,000
Debt interest rate	%	7%
Debt term	yr	15
Debt payments	ETB/yr	12,450,710

All the expenses and yearly debt payment are discussed in table:4 and the project have to pay 12,450.710 ETB annually. The viability is then examined based on annual revenue analysis and it is given in table:5.

Table-5: Annual revenue

Electricity export revenue		
Electricity exported to grid	MWh	275,701
Electricity export rate	ETB/kWh	0.35
Electricity export revenue	ETB	96,495,490
Electricity export escalation rate	%	2%

For the annual revenue analysis, the electricity export rate to the grid is taken 0.35ETB/KWh which is the less than the current rate of 0.5ETB/KWh, and all calculations are based on this assumption.

D. Emission Analysis

The main target of installing renewable energy sources as power means is reducing the Greenhouse Gas emission and this study also investigates how much GHG will be reduced, if the location is solely depending on natural gases instead of renewable energy for the same amount of 100MW annually. The gross annual greenhouse gas reduction is about 93% and this is a meaningful value this is shown in fig.2 and, installing a 100MW PV power plant will reduce the GHG emission from 2188.4 tCO₂ to 152.2 tCO₂ annually and this is shown in Fig.3.

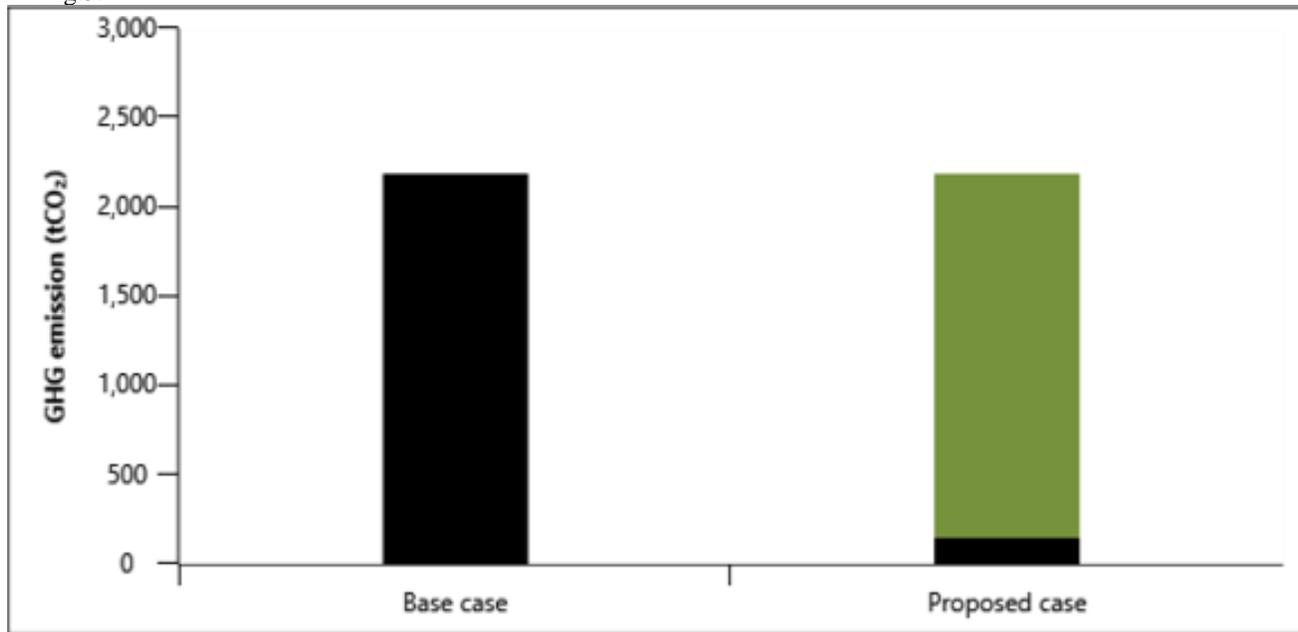


Figure-2: GHG Emission Reduction

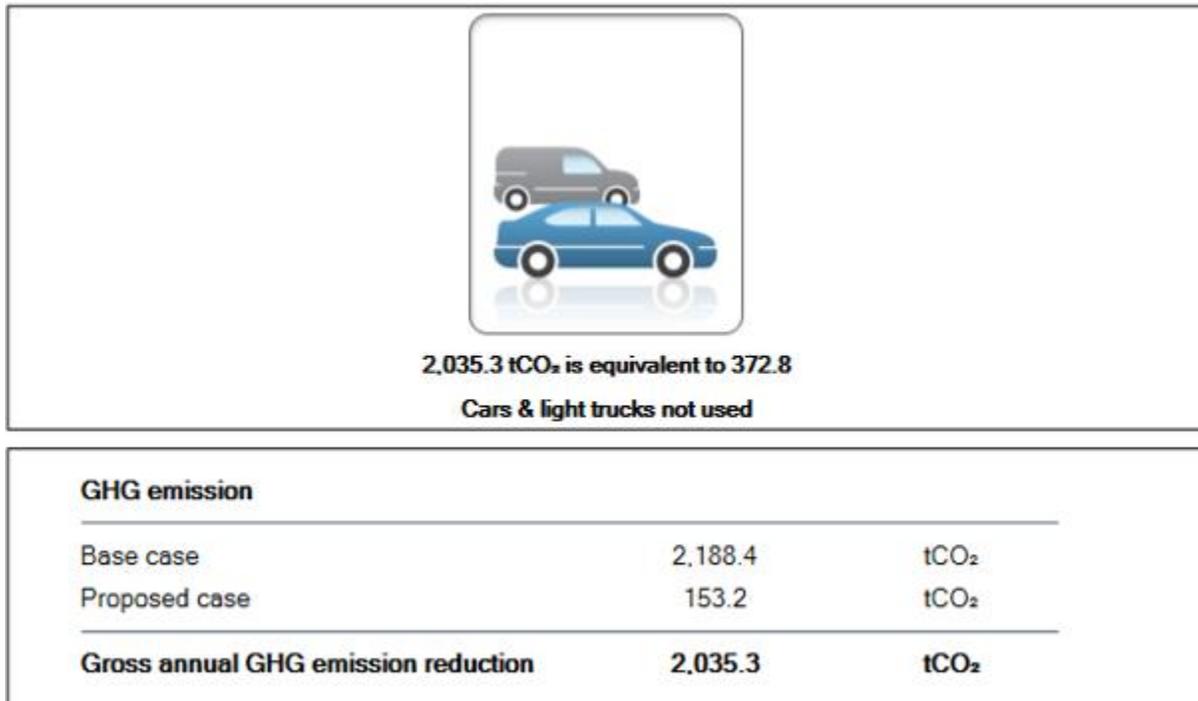


Figure-3: GHG Equivalence

According to GTP II the Country is heading to green Solely green energy by 2025 and already started some positive works to exploit solar and wind energy, this value with the solar power potential is very vital as it forces the government and investors to look for another options for power production from solar Radiation.

E. Annual Cash flow and Cumulative Cash Flow

From section 3.3 and 3.4 the electricity exported to grid is 275,701MWh, electricity export revenue is 96,495,490 ETB and the GHG emission reduction is 2,035.3 tCO₂. Based on this and other consideration the Annual and cumulative cashflow analysis has been made and the results are given in figure 4&5. According to [16] A positive result indicates that the company generated more cash than it has spent and for this case in figure 5, the company has generated more cash than the spent. The project profitability is not under question and the results genuinely explains that the cash flow since the beginning is positive except at the first year of the project execution.

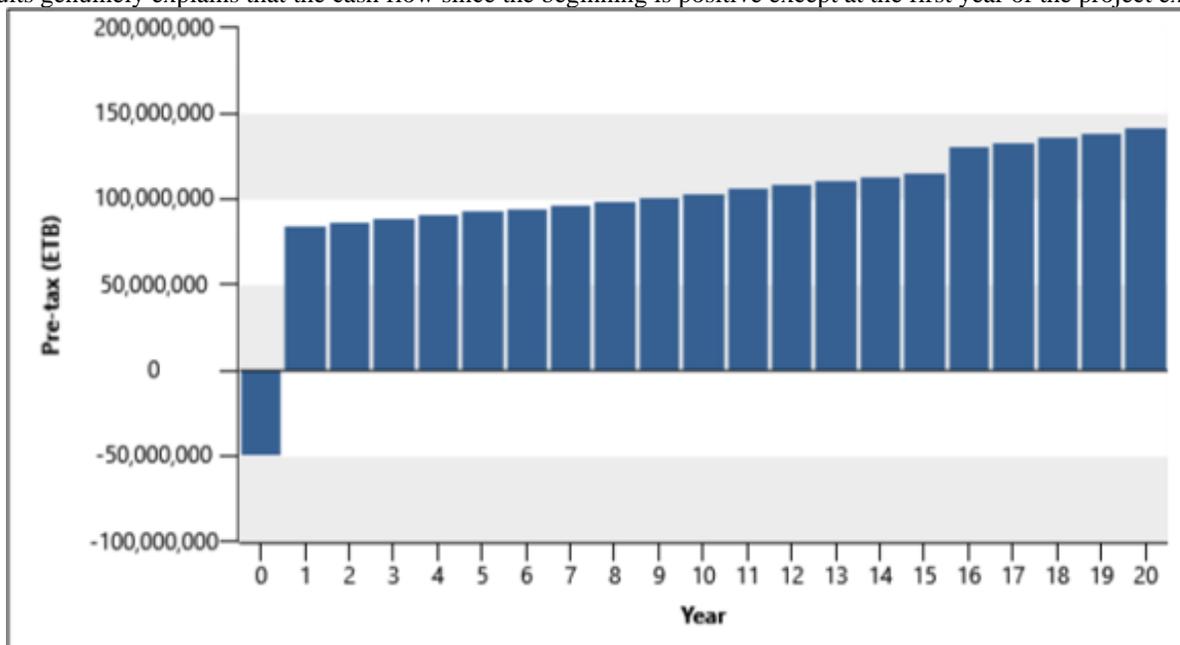


Figure-4. Annual Cash Flow

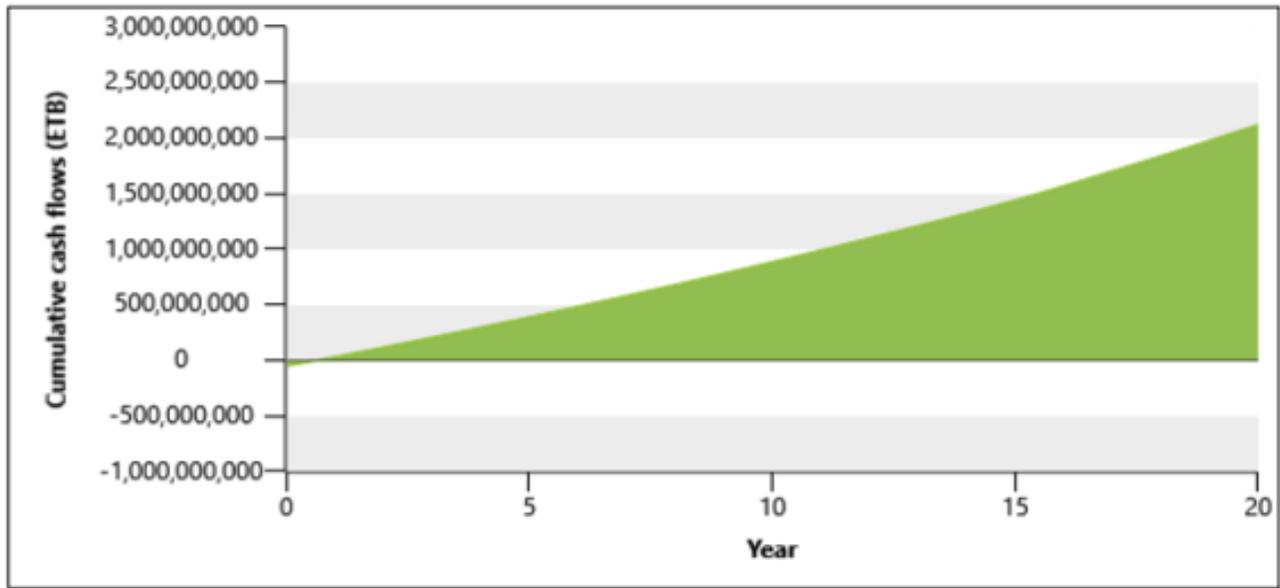


Figure-5. Cumulative Cash Flow

F. Net present Value (NPV)

Net present Value will tell us whether we are getting a positive or negative return on investment and the analysis for this study was made based on the relative impacts of the parameters on the NPV. The relative impact of parameters on NPV is given by Figure 6.

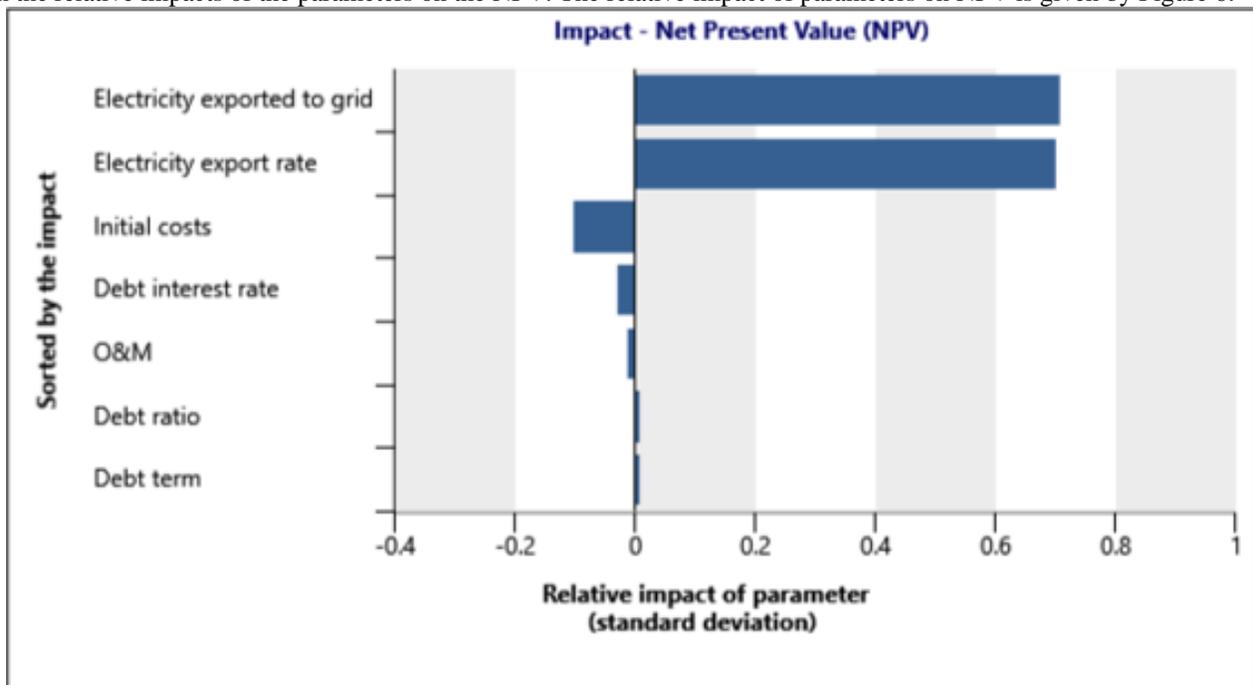


Figure-6: Parameters Impact on NPV

From the impact of the parameters and the NPV value remains positive, therefore, the project gives positive return. And, the distribution of the NPV is given below in Figure 7.

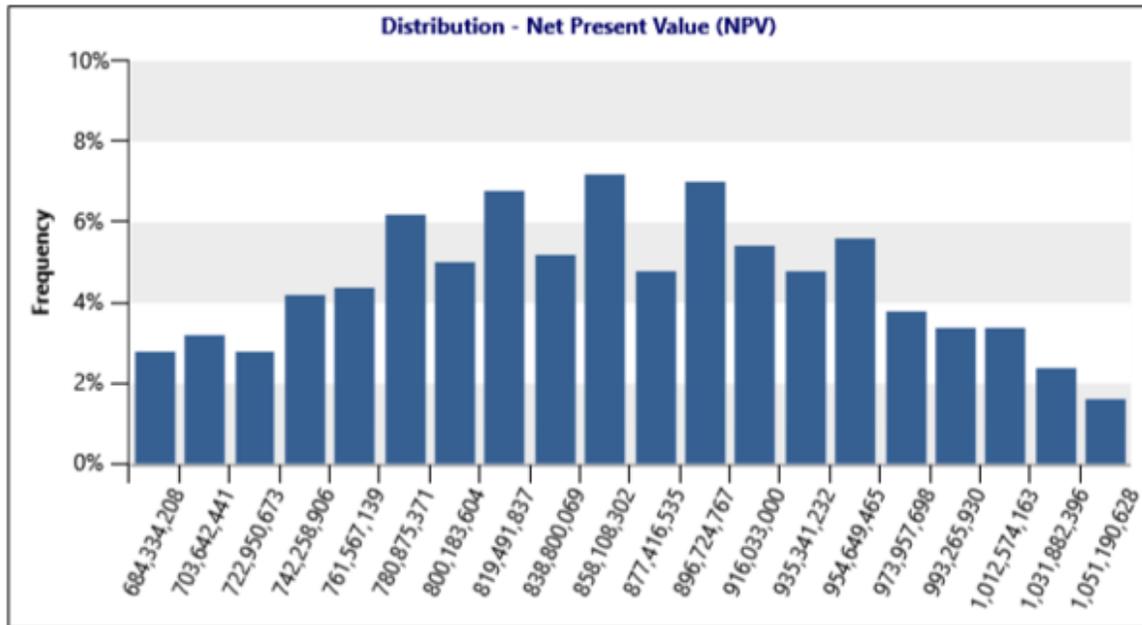


Figure-7: Distribution of NPV

IV Conclusion

The feasibility study of a 100MW PV powerplant in Bati, Ethiopia has been completed and the following conclusions are made based on the results.

1. From bench mark analysis employing a PV power plant at Bati will reduce the energy cost of production from 2.61ETB/KWh to 1.6KWh. and this alone can tell us the feasibility.
2. Installing this plant in Bati, Ethiopia will reduce the GHG emission from 2188.4 tCO₂ to 153.2 tCO₂. And, this result shows that the plant has a great role in reducing the GHG in a meaning manner.
3. The Cash flow and the NPV shows positive results

From the above points it is concluded that the project is feasible technically, financially and environmentally. And, it will play a great role for the country to achieve its goal by 2030.

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The effectiveness of the custom spectacle and ready-made spectacle interventions in improving visual acuity: Study Protocol for non- Inferiority Double Blind Randomized Clinical Trial among school children in Yangon Region, Myanmar

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DOI: 10.29322/IJSRP.10.09.2020.p10509

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10509>

Abstract- Refractive error (RE) is a very common eye disorder among school children, resulting in impaired vision in 2.6 billion people globally. Among them, 312 million were under 19 years of age. Programs have been rolled out in low-income settings, providing spectacles to school children with uncorrected refractive error(URE). However, for a program to meet the needs, spectacles dispensed need to be affordable, accessible, feasible, and visually functionally improvable. Different studies have shown different findings on compliance, visual acuity improvement and cost of provision of the ready-made spectacles (RMS) and the custom-made spectacles (CS), spectacles with the correction specifically required for that individual. In Myanmar setting, there has not been studied the effectiveness of ready-made spectacles. This non- inferiority double blind randomized clinical trial aims to determine the compliance of the prescribed spectacles and to test non-inferiority in improving visual acuity between the ready-made and custom spectacle interventions to treat uncorrected refractive error among school children in Myanmar. The accurate, up-to-date, evidence-based data on the prescription of spectacle options will fill the current knowledge gap of the main policymakers, the Ministry of Education, the Ministry of Health and Sports, and related partners who are planning to provide school-based vision care services for school children in Myanmar near future.

Index Terms- Non- Inferiority Double-Blind Randomized Clinical Trial, Refractive Error, School Children, Myanmar

I. INTRODUCTION

The refractive error(RE), or ametropia, is a defect in the lens' ability of the eye to focus an image. RE is a very common eye disorder among school children, resulting in blurred vision, which is sometimes so severe, leading to visual impairment. The World Report on Vision 2019 stated that global estimates of the number of people affected by myopia were 2.6 billion, and among them, 312 million were under 19 years of age¹, which is projected to increase to 324 million by 2025². Promoting and improving the eye health of all, including children, contributes to several of the Sustainable Development Goals³. The estimated pool prevalence of myopia, which is the most prevalent type of RE, was 4.9% in South-East Asia⁴. Urban school children have high myopia prevalence and are observed as major public health^{5,6,7}.

Programs have been rolled out in low-income settings, providing spectacles to people living with uncorrected refractive error(URE) in South East Asian countries like in Cambodia⁸ and Indonesia⁹. For a program to meet the needs of a population living with URE, spectacles dispensed need to be affordable, accessible, easily obtainable, well tolerable, durable, cosmetically acceptable, and visual functionally improvable. School-based screenings for refractive error and on-site spectacle provision is one solution outlined in the World Health Organization Vision 2020 targets for control of blindness in children. In some countries, to overcome cost constraints, ready-made spectacles (RMS), spectacles without astigmatic correction and with the same refractive error in both eyes, have been

used for spectacle delivery programs in some low-resource settings¹⁰. It is assumed that the RMS program carries an inventory of lower cost and new spectacles of commonly required powers, which can be provided to patients on the spot compared with the custom spectacles (CS), that is, spectacles with the correction specifically required for that individual, which can provide full correction of astigmatism and anisometropia as an advantage; however, it is expected as a costlier option¹¹.

Some countries like in India; school eye-screening programs CS regardless of severity or type of RE. These spectacles are not only more expensive to dispense than ready-made spectacles (RMS) but also require dispensing opticians, and cannot be dispensed immediately in schools as a one-stop service. However, on the other hand, when RMS is offered free, they are worn by less than 1 in 6 children and were available for use at school in less than half of cases for parents' ignorance, glasses were socially unacceptable, and broken or lost¹². A cost-effectiveness analysis of a double-masked randomized controlled trial to determine the relative cost-effectiveness of offering RMS and CS to treat URE among adults found that there was no significant difference between the effectiveness in improving visual acuity between them, but the CS was over four times the price of the RMS per patient. According to this study, the RMS program was found effective and cost-effective option than CS, providing further support for including RMS in programs to address URE¹³. Regarding compliance among school children, another randomized clinical trial of a school-based program RMS versus CS was studied in Banglor, India, found that the proportions in the RMS group were 'not inferior' when wearing spectacles compared to the CS group after 3 to 4 months of trial. Follow-up rates at 3 to 4 months were also similar to 78% in the RMS group versus 79% in the CS group¹⁴.

Similar findings were seen in China's study. In uncorrected visual acuity $\leq 20/40$ in the better-seeing eye group showed a 91.1% improvement by ≥ 3 lines of visual acuity with refractive correction and the $\leq 20/50$ group showed a 97.4% improvement by ≥ 3 lines, suggesting that RMS could substantially alleviate visual morbidity in two-thirds or more of visually impaired schoolchildren in China¹⁵. Conversely, visual acuity was lower in RMS than in CS in the other study in China, but there were no differences in the rate of wearing after the 1-month visit among students with a predominantly simple myopic refractive error¹⁶.

However, dispensing RMS remains problematic and more expensive owing to the logistics cost resulting from choosing different varieties of the spectacle frame and powers of spectacle, expense, and reports of low compliance^{12, 17, 18}. Therefore, RMS might not always be assumed to be a feasible, affordable, and preferable option compared to CS. Moreover, depending on the severity of visual impairment and lack of correction for astigmatism and anisometropia, the percentage of children who could be accommodated in gaining visual acuity with RMS might differ from CS. In the Myanmar setting, there have been no visual acuity evaluations examining the effectiveness of ready-made spectacles. Therefore, it is fruitful to investigate the relative effectiveness of offering spectacles, either RMS or CS, in Myanmar. The accurate, up-to-date, evidence-based data on the prescription of spectacle options will fill the current knowledge gap of MOHS and related partners, who are planning to provide school-based vision care services for school children in Myanmar near future.

Aims of the study

This study aimed to determine the relative effectiveness of offering spectacles to treat uncorrected refractive error and to test non-inferiority in improving visual acuity between ready-made spectacles and custom spectacles interventions in Myanmar. To the best of our knowledge, this study of this nature has not been conducted in Myanmar. In a low-resource country like Myanmar, the development of school-based vision care programs with the provision of affordable, accessible, feasible, and visual functionally improvable spectacles will be beneficial to school children with RE. The research hypothesis to be tested is that ready-made spectacle intervention is not inferior to custom spectacle interventions in improving visual acuity.

II. METHODOLOGY

Methods:

2.1 Study design

This is a non- Inferiority Double Blind Randomized Clinical Trial to determine the effectiveness of ready-made spectacle as interventions and the custom spectacle as control and in improving visual acuity among school children in Yangon Region, Myanmar.

2.2 Settings and study population

We will recruit primary, middle, and high school students (from Grade 3 to Grade 10) from one urban township in Yangon, Myanmar to involve in the study. Inclusion criteria are school children of both sexes aged between 8 and 16 years with at least -0.50 D (20/40 in Snellen's Chart) and <-4.0 D, i.e. 20/300 in Snellen's Chart) of myopia. Those aged less than 8 years or over 16 years with significant RE, best VA <2 lines in both eyes ($<20/40$), reduced VA, not for URE, further examination required, with ≥ 2.00 D astigmatism, ≥ 2 D myopic anisometropia (the condition in which the two eyes have unequal refractive power), and ≥ 1 D hyperopic anisometropia and ocular disease affecting vision will be excluded from the study.

2.3 Sample size determination

The total minimum required sample is 250 to complete in each arm to be able to measure a 1% difference, assumed percent 'visual acuity' in the CS group with 80% and assumed percent 'visual acuity' in the RMS group with 79%. If there is a true difference in visual acuity, to be 80% sure that the upper limit of a one-sided 95% confidence interval will exclude a difference in favor of the CS group of more than the non-inferiority limit 10%. The alpha error is considered as 0.1 with 80% power.

Since there has been no previous study relating RMS and CS to improvement in visual acuity and cost effectiveness, especially in the Myanmar context, the following assumptions have been made. In the RMS group, the incremental power of the RMS is 0.25 diopters and many resource-poor countries have utilized this increment to limit its inventory and as such many children will have spectacle powers not falling within its increment. The assumption, therefore, is that only 79% of children will have VA Snellen 20/20. In the CS group, although the correct prescription in diopters may be provided, the optical technician in the optical shop in close proximity to the school may not be able to provide accurate spectacle power as per the prescription. As such, the assumption is that only 80% of the children will have VA, Snellen 20/20.

2.4 Sampling Procedure

Multi-stage sampling was used. In stage 1, a list of all townships was initially made along with their estimated population size in the Yangon region. Urban and rural population sizes are listed separately for each township. Townships that have more than 50% of their population are classified as urban townships. Using simple random sampling, two urban townships in the Yangon Region were selected. Stage 2 was the selection of public schools within each township. In each township, all public schools with student lists within these townships are recorded to be used as a sampling frame. Using simple random sampling, schools were selected to recruit approximately 5000 to 6000 school children for vision screening, assuming that 24.5% of school children had myopia¹⁹. Stage 3 involved random selection of children to participate in the survey. A list of all students and their ages were obtained by the study team. Each and every student who gives informed consent will be screened for their vision. From the eligible participants, simple random sampling was used to get the required sample size of 500. A replacement was selected through simple random sampling of the selected students who were not available. If any student refused to participate, then a replacement was selected through simple random sampling. During the recruitment process, all children requiring spectacles, whether eligible for the trial or not, were allowed to select the frames they preferred from a range of colored plastic or metallic frames.

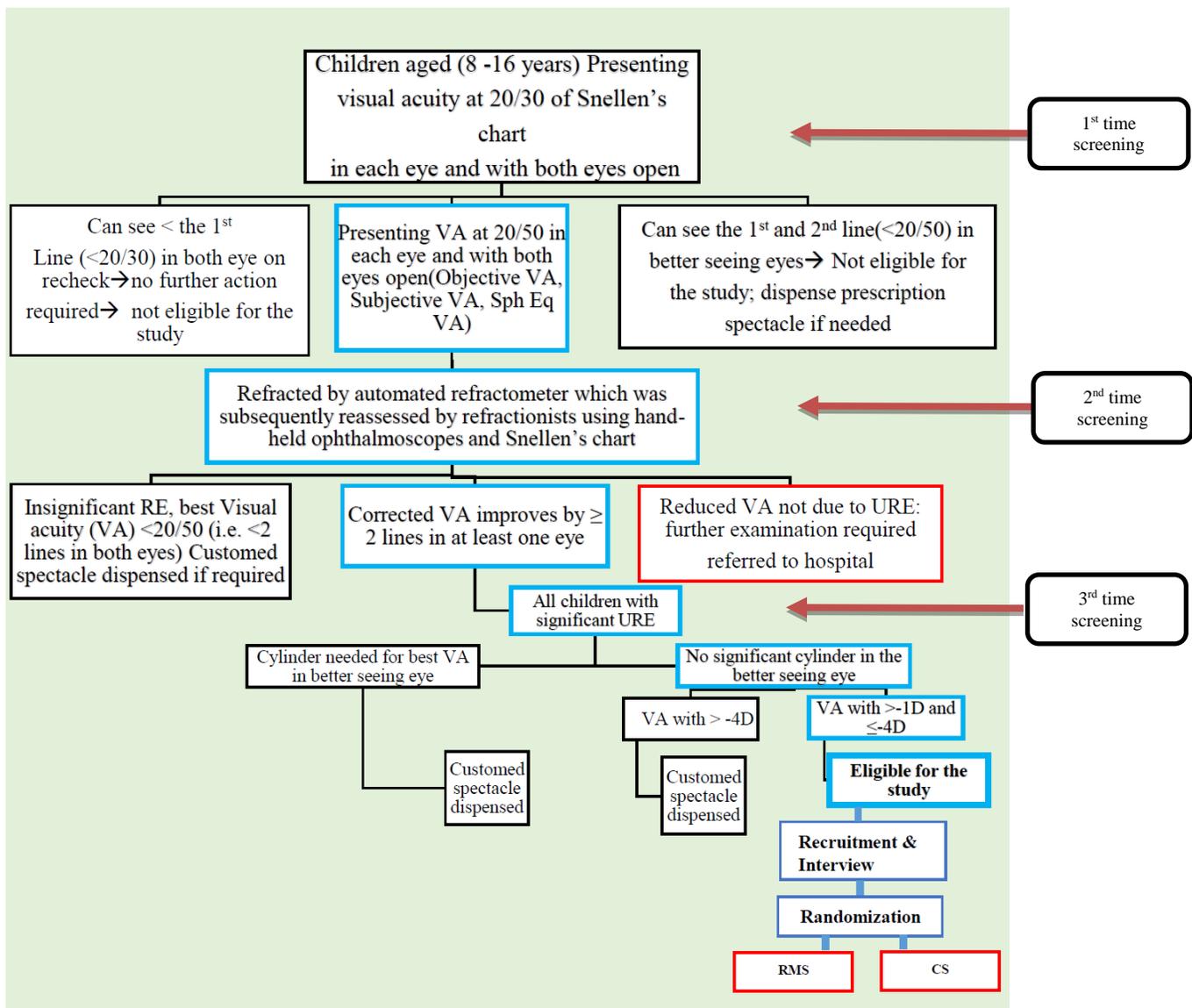


Figure 1 Randomization flow chart to show recruitment process for eligible participants and randomization

The flow chart in Figure 1 shows the activities involved from screening to deciding whether school children are eligible for recruitment. In the schools selected for the trial, trained teachers are going to measure visual acuity at the 20/30 level in each eye and with both eyes open, with spectacles if the child usually wears them. Snellen's chart will be used at the recommended test distance of 20 feet. School children who pass the screening test will be excluded from the study.

All children who present with visual acuity at 20/30 of Snellen's chart in each eye with both eyes open will continue to undergo a second time screening of both objective and subjective refraction by the refractionists. School children who have insignificant RE (better VA <20/50 or <2 lines in both eyes) will be excluded from the study after dispensing the custom spectacle if required. School children with reduced VA, which is not due to URE, will be referred to Yangon Eye Hospital for further examination.

Only school children who have corrected VA improvement by ≥ 2 lines in at least one eye will continue to undergo third time screening. School children who have a cylinder for the best VA in a better seeing eye will be excluded from the study after dispensing the custom spectacle. School children with no significant cylinder in the better-seeing eye, but VA with $> -4D$, they will also be excluded from the study after dispensing the custom spectacle. Only school children with VA between $> -1D$ and $\leq -4D$ will be eligible for the study.

Randomization (Block randomization)

A consent form will be given to eligible children to be signed by their parents and return to the school. After recruitment, block randomization will be conducted to ensure a balance between treatment groups, in “blocks size of four” with each block having equal numbers of ready-made spectacle group (A) and custom spectacle group (B) in a ratio of 1:1. All possible six block permutations will be AABB, ABBA, BBAA, BAAB, ABAB, and BABA. A block will be chosen at random and treatments will be allocated accordingly. Allocation concealment will be obtained by using the random allocation sequence by block randomization, which will be conducted solely by the principal investigator (PI). No other person except PI will not be accessible to information regarding enrollment of participants, allocation sequence, and assignment of participants.

Masking

At the study site, PI will be the only person who will select envelopes that contain block assignment randomly. No other person except PI will be inaccessible to ensure allocation concealment. All school children and refractionists who will administer the interventions will be blinded to the group assignment in order to be double blind. Those recruited to the study will receive either RMS or CS free of charge. Participants will then be evaluated when they receive their spectacles and after 1 month of wear (Figure 2).

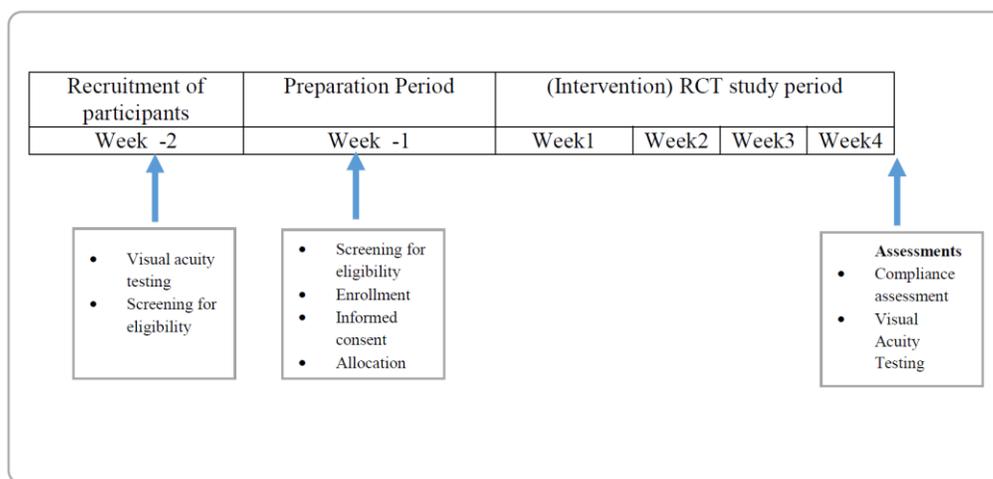


Figure 2 The schedule of enrolment, interventions, and assessments

2.5 Data collection methods and tools

Visual acuity measurement and data collection: At the start of the trial, a qualified refractionist or optometrist will measure visual acuity using objective refraction by retinoscopy, and auto-refractor and subjective refraction using loose trial lenses under the close supervision of an ophthalmologist. For the participants, having own spectacles will be rechecked prior to receiving the study spectacles. Visual acuity is measured using the foot (fractional) in Snellen’s chart of 20/20 scale, and then converts to LogMAR scale to get continuous variables using a conversion table²⁰. RE scores will be recorded in the participant’s record. Then, the enumerator will record the score after asking a short survey, using a set of pre-coded questions in the KoBo collect toolkit. Record sheets will then be uploaded and the PI will check for their completeness and accuracy. To reduce inter-observer variation as low as possible, inter-observer agreement between refractionist in visual acuity testing and refraction will be evaluated through test-retest measurements during the training period. Standardization of clinical methods and procedures for refractionist is an important part of training. Data collection survey team will consist of three qualified refractionists, two trained enumerators, an ophthalmologist, and a team leader.

Spectacles prescription:

- i. For the trial group, the spectacle lenses used in the RMS group will be -0.50 D to -4.0 D in 0.25 steps and have the same power in each eye.
- ii. For the comparator group, the spectacle lenses used in the CS group are the exact power resulting from visual acuity testing by refractionists for each child.

The researcher will provide all the cost of procurement of both RMS and CS spectacles that will be ordered from the optical store to get the exact power of the participants. The spectacles will be fitted by the refractionist and dispensed by the researcher in a subsequent visit to the school for those participants receiving either RMS or CS.

Visual outcome measurement at the end of the trial: Corrected vision will be measured with the study spectacles. After the spectacles have been fitted and dispensed, they will be followed up after one month. Outcomes are measured at the start date of the intervention pre- intervention and within one week after the intervention for post-intervention.

The primary outcome is compliance to the provided spectacles. We will assess the proportion of children who are wearing spectacles at an unannounced visit to the school 1 month after the spectacle dispensing. A field worker, masked to the allocation arm, assesses spectacle wear and categorize whether wearing the spectacles at the time of the visit, not wearing the spectacles at the time of the visit but have them at school, not wearing the spectacles at the time of the visit but said they are at home, and not wearing the spectacles due to loss or broken.

The secondary outcome is the visual acuity in both the RMS and CS assigned children. In both groups it is determined for children with 20/20 (best corrected visual acuity) and those children with 20/25 (acceptable visual acuity) using Snellen's Charts. They are regarded as those with normal vision. Line read on the Snellen's chart by better seeing eye are noted and converted to the LogMAR Scale by the score conversion table described above²¹. For both groups for measuring visual acuity, both auto refractor and trial lenses will be used for measurement of VA (Table 1).

Table 1 Outcome variables and measuring instruments/ procedure

Outcome variable	Measuring Instrument/ procedure
compliance to the provided spectacles	Using the follow-up data collection form, the field worker asks the child the reason and this is coded and recorded.
Visual acuity	Using both auto refractor and trial lenses, the refractionsits will record the line read on the Snellen's chart by better seeing eye are noted and converted to the LogMAR Scale by the score conversion table.
Visual acuity improvement	Difference in visual acuity before and after wearing of spectacles in both groups

2.6 Data management and analysis

All refractionists have been trained, including inter-observer agreement studies for visual acuity measurement and refraction, all enumerators for data recording. Using password protected databases in Excel, all the data resulted from the KoBo collect will be entered. Data management team will keep recording forms and the data with the high concern of safety during the trial. Microsoft Excel 2016 will be used for data entry and the generation of graphs. STATA version 15 will be used for all statistical analysis. To have comparability of the intervention and control groups, characteristics of participant will be compared by sociodemographic characteristics, degree of uncorrected refractive errors, and presenting visual acuity in the better eye. Baseline data will be fitted in an analysis of covariance(ANCOVA). The randomization code will only be removed after analyzing all the data. 95% two-sided confidence intervals will be used for statistical uncertainties. A p -value of <0.05 will indicate statistical significance.

Data monitoring

Monitoring committee for data will not be necessary because both arms are non-invasive and not novel procedures but are in common use in daily practice. Significant adverse effects are not expected. As interim and subgroup analyses are not planned in the protocol, there will be no stopping rules.

Protocol amendment

No important protocol modifications, such as changes to eligibility criteria, were required.

Ethical consideration

This randomized controlled trial will ensure; free and independent choice of the participant without coercion, provision of informed consent of the participants, maximum benefit with minimum risk, equal opportunity for all to participate in the trial, and no therapeutic misconception in the mind of the participants. The study will be conducted in accordance with the principles put forward in the Declaration of Helsinki in its current version.

Harms

In order to prevent harmfulness to the participants, it will be ensured to prescribe accurately to fitting of spectacles as unfitted spectacle can cause blurred vision and symptoms of eyestrain or headache. All refractions in this trial will be operated and prescribed by highly experienced and qualified refractionists. School children who have refractive errors but not suitable for ready-made spectacles are not eligible for the trial, thus, harm resulting from under or over correction will be reduced. Any child who says that blurred vision, eyestrain or headaches after wearing the prescribed spectacles will be refracted again and given a new pair of spectacles, if necessary. The study presents no additional risks to participants beyond those posed by assessment of visual acuity for RE.

Informed consent of Individuals

All participants will be required to give their written consent before they are enrolled into the study. As part of the informed consent process, the purpose of the study and all study procedures will be explained to them. All participants will have the right to withdraw from the study at any moment, without jeopardizing their access to any services.

Risks to Confidentiality

The following risks are associated with a potential breach of confidentiality: social risk due to stigma or other negative social outcomes of breach of confidentiality. There are other potential minor risks and concerns associated with participation in this study, including: inconvenience when the interview is taking longer than expected to administer; emotional or psychological effects if the topics of the interview arouse negative emotions, given the potential sensitivity of the issues to be studied.

To limit potential risks, participants will be informed as per the assent form that they can choose to not respond to any of the interviewer's questions and will be allowed to cease the study at any time. Participants will be provided contact information for the study by Principal Investigator, who will be available to answer any questions about the study at the conclusion of the interview process. All data will be de-identified on entry into electronic files, and personal identifying information will be removed from paper survey forms once data has been transferred to electronic files. A unique identifier code will be created to link the paper copies of completed surveys to each case in the electronic files, in case there is the need for verification during the data cleaning and analysis process.

Data Sharing

The Principal Investigators' role will be to ensure that the project is conducted as per the protocol and consistent adherence to operational procedures. The research will be monitored by the Principal Investigator(PI)and Co PIs. The results of the study will be made widely available in Myanmar. It will serve to inform the eye health practitioner community, those engaged in policy development at the Ministry of Health and Sports, academics working in the field of eye health in Myanmar, and an international community of interest. PI will hold a series of dissemination events to publicize the findings and be active partners in discussions about their implications for improving eye health services for school-aged children in Myanmar.

Trial status

Recruitment was ongoing at the time of submission. Recruitment has been started on August 2020.

III. RESULTS

The proposal of this study was submitted to the board of studies and ethical approval has been received from the Institutional Review Board (IRB) of the University of Public Health, Yangon. It is also registered by Preliminary Registration: PLRID-00565_V1 at Myanmar Health Research Registry, Department of Medical Research, Yangon, The Republic of the Union of Myanmar. The trial will be conducted in August 2020, expected to be completed by September 2020. Final report will be submitted by December 2020. Trial registration data is described (table2).

I. Table 2. Trial Registration Data

Table 2 Data category and information of the trial

Data category	Information
Registry and trial identification number	PLRID-00565_V1
Protocol version	First version (June 9, 2020). No important protocol modifications, such as changes to eligibility criteria, were required.
Date of registration	1 February, 2020
Source(s) of monetary or material support	Ministry of Health and Sports, The Republic of Union of Myanmar
Primary sponsor	Implementation Research Grant of Ministry of Health and Sports, The Republic of Union of Myanmar
Contact for scientific queries	Soe Min Oo, MB,BS, MPH, MS Epidemiology, Department of Sports and Physical Education, Ministry of Health and Sports, Myanmar
Public Title	The effectiveness of the custom spectacle and ready-made spectacle interventions in improving visual acuity
Scientific Title	The effectiveness of the custom spectacle and ready-made spectacle interventions in improving visual acuity - non- Inferiority, Double Blind, Randomized Clinical Trial
Country of recruitment	Myanmar
Health condition(s) or problem(s) studied	Vision Impairment
Intervention	Ready-made spectacle provision as trial and custom spectacle as comparator
Key inclusion and exclusion criteria	Inclusion criteria: School students aged 8 to 16 years of both sexes from one urban township in Yangon, with visual acuity -0.50 D to <-4.0 D of myopia. Exclusion criteria: aged < 8 years or >16 years with significant RE, best VA <2 lines in both eyes, reduced VA, not due to URE, further examination required, with ≥ 2.00 D astigmatism, ≥ 2 D myopic anisometropia, and ≥ 1 D hyperopic anisometropia and ocular disease affecting vision.
Study Type	Interventional Allocation- non- inferiority, Double Blind, Masking, Randomized Primary purpose: Prevention
Date of first enrolment	1 August, 2020
Target sample size	500
Recruitment status	Recruiting
Primary outcome(s)	compliance to the provided spectacles
Key secondary outcomes	Visual acuity, visual acuity improvement

IV. DISCUSSION

This trial is designed to explore whether ready-made spectacles are not inferior to compliance of spectacle wearing and improvement of visual acuity compared to custom spectacles. The findings of the study will disseminate to all the policy makers from the Ministry of Education and the Ministry of Health and Sports for the development of school-based eye health care programs and strategies to mitigate the burden of refractive error among students in Myanmar.

V. ACKNOWLEDGEMENT

This work was funded by the Implementing Research Grant of the Ministry of Health and Sports(MOHS), The Republic of Union of Myanmar. We deeply appreciated MOHS for financial support for the study. The authors gratefully acknowledge members of Institutional Review Board (IRB) of the University of Public Health, Yangon, The Republic of Union of Myanmar.

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Conflict of interest: No conflicts of interest
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The Relationship between Social Media Usage and Students' Self-esteem among Wolaita Sodo University Students

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DOI: 10.29322/IJSRP.10.09.2020.p10510

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10510>

Abstract- Social media websites are the most common activity of today's youth students. The main purpose of this study was to investigate the relationship between social media usage and Self-esteem among Wolaita Sodo University students. The research employed cross-sectional survey research design with quantitative approach of data analysis. From the total population of 11,650 (7,174 males and 4,473 females) students, 763 (470 males and 293 females) students were selected by using systematic random sampling technique after employing stratified random sampling technique to select participants based on sex, year level and College. The finding of the study revealed that the major purpose of social media usage among Wolaita Sodo University students was to have good relationships with others and in touch with friends and family. The extent of Social media usage of was found to be high. Majority of students had low status of self-esteem. Sex difference in social media usage revealed that male students use social media higher than that of female students. Sex difference in terms of self-esteem indicated that there was difference between male and females university students in their self-esteem. Analysis Age group and year level difference in social media usage result revealed that there was no significant difference in both age group and year level in social media usage. Finally Pearson correlation indicated that there is negative week relationship between social medial usage and students' self-esteem. Possible recommendations are forwarded to the students, the University and other concerned bodies like government and non-government organizations.

Index Terms- Social Media, Self- esteem

I. INTRODUCTION

Early 21st century marked the emergence and growth of social networking sites in the whole world. Since then these sites have become a major part of people's lives, specially the lives of the youth/students. Many students are using social media, especially Facebook, to build relationships, connect with the world, share and gain knowledge and information, build stronger personalities and have better social lives (Boyd, 2007). Mitchell (2002) claimed that social networking sites are used by youngsters to get engaged in romantic and casual online relationships.

University students are among the highest users of technology and are typically early adopters of new technologies, including internet, mobile phones, social media and other devices. They are born into the age of technology compared to previous generations who learnt to use it after they were older. Thus, it is also younger generations who have a harder time separating themselves from technology because they might suffer socially among peers if they are not up to date or well connected. As a result, a lot of time is spent on all these forms of technology and it is now increasingly integrated into students' lives. Students say that technology has become an immensely important part of everyday life. Most say it is because it helps them keep in touch with their friends as well as their parents (Richards et al.; as cited in Ahmed Moawad & Soliman Ebrahim 2016).

Using social media Websites is among the most common activity of today's students. Any Website that allows social interaction is considered a social media site, including social networking sites such as Facebook, MySpace, and Twitter; gaming sites and virtual worlds such as Club Penguin, Second Life, and the Sims; video sites such as YouTube; and blogs. Such sites offer today's youth a portal for entertainment and communication and have grown exponentially in recent years. For this reason, it is important that parents become aware of the nature of social media sites, given that not all of them are healthy environments for students (O'Keeffe & Pearson, 2011).

According to Chen & Lee (2013) social media usage negatively influences students' self-esteem. It has been observed by the changing behavior of the people that social media has many negative repercussions on people. Social networking sites help people to make social comparisons which increase the psychological distress of individuals and as a result lower the overall level of self-esteem. Many observers and researchers believe that due to increase in the

usage of social networking sites, people have become the victims of lower self-esteem and self-growth (Jan, Soomro & Ahmed, 2017).

The present study tried to reveal social media usage relationship with students' self-esteem. The researcher tried to see different international research works that were focusing on the relationship between social media usage and students' self-esteem but the researcher found few studies which were took place relating social media usage and students self-esteem in Ethiopian context. The main aim of this study was expanding on previous researches, which explore the relationship between social media usage and students' self-esteem. In order to achieve the big aim of the study the following basic research questions were answered:

1.1. Research Questions

- What is the purpose of social media usage among Wolaita Sodo University students?
- What is the extent of social media usage by students of Wolaita Sodo University?
- What is the status of students' self-esteem of among Wolaita Sodo University students?
- Is there any difference in sex among students in terms of social media usage and self-esteem?
- Is there any difference in age group and year level among students in terms of social media usage?
- Is there relationship between social media usage and self-esteem of students in Wolaita Sodo University?

1.2. Definitions of Basic Terms and Operational Definition

- i. Social Media: Social media (sometimes Social Network Site) the websites which are Facebook, Imo-beta, Whats App, Viber, Tele-gram and You-Tube and they will be used by Wolaita Sodo University students via computer, phone, or tablet through a particular network.
- ii. Students: Students in this study refers to participants of Wolaita Sodo University undergraduate students who are enrolled academic year of 2020 G.C.
- iii. Self-esteem: is defined as the value or worth placed on the self and behavior or it is the way in which people perceive and value themselves.

II. MATERIAL AND METHODS

2.1. Design

This study employed cross-sectional Survey research design with quantitative approach of data analysis. In cross-sectional study data were collected at a single point in time to examine the relationship between the variables of interest. This study employed this method because the researcher was interested in whether and to what extent a relationship exist between social media usage and self-esteem among students of Wolaita Sodo University.

2.2. Study Area

The study was conducted in Wolaita Sodo University. Wolaita Sodo University is one of the second generation public higher institutions in Ethiopia, located in Wolaita Sodo town, 315 km away from Addis Ababa. The University was inaugurated on March 24, 2007 G.C. The University currently constitute 52 undergraduate, 34 graduate programs including two PhD programs are running under six colleges and six schools.

2.1. Population of the Study

The total population of this study was obtained from the students of Wolaita Sodo University. Sources of population included all Gandaba, Ottona and Dawuro-Tarcha campus, Wolaita Sodo University students who attended their education in academic year of 2019/20 G.C. and involved all regular undergraduate students of Gandaba, Ottona and Dawuro-Tarcha campuses of Wolaita Sodo University with total population of 11,650 (7,174 males and 4,473 females).

2.2. Sample Size and Sampling Techniques

While the participation all population in study is impossible, determining of sample size critical issue in the process of research. Due to time and financial limitations the sample size of this research was determined by a simplified formula proposed by Slovin's (as cited in Israel, 2013), the formula is given by equation $n = \frac{N}{1+N(e)^2}$

Where,

n = sample size

N = population and

$e = 0.035$ which is level of precision with 95% confidence interval.

Hence using this formula with significance level $p = 0.035$ and population size $N = 11,650$ yields

$$n = \frac{11,650}{1 + 11,650(0.035)^2} = \frac{11,650}{15.27} = 762.93 \approx 763$$

Therefore, out of total population (11,650) students, the determined sample size 763 (470 males and 293 females) participants was participated in this study as show in Table 1.

Table 1: Number of Participants Selected by College/school, year level and Sex

	College/School																			
	CSSH		CoE		CBE		CHSM		CNCS		COA		SEBS		SoL		SVM		SoI	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
	785	670	2673	1161	527	319	882	431	581	534	840	799	175	182	162	83	168	48	371	249
No of students in each college/school	1,455		3834		846		1,313		1,125		1,639		357		245		216		620	
Number of students in each year	1 st				2 nd				3 rd				4 th				5 th			
	3,217				2,837				3,138				1,315				1,143			
Sample drawn by PSST based on college/school	Expected sample by each college/school = $\frac{\text{Number of students in each college/school level}}{\text{total number of students in WSU}} \times \text{total sample size}$																			
Sample size of students by college/school	95		251		56		86		74		107		23		16		14		41	
Sample drawn by PSST based on year level	Expected sample in each year level = $\frac{\text{Number of students in each year level}}{\text{total number of students in WSU}} \times \text{total sample size}$																			
Sample size by year level	1 st				2 nd				3 rd				4 th				5 th			
	210				186				206				86				75			
Sample drawn by PSST based on sex	Expected sample in each college/school by sex = $\frac{\text{Number of female/male students in each college/school}}{\text{Total number of students in each college/school}} \times \text{sample size of each college/school}$																			
Sample size by sex	CSSH		CoE		CBE		CHSM		CNCS		COA		SEBS		SoL		SVM		SoI	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
	51	44	175	76	35	21	58	28	38	36	55	52	11	12	11	5	11	3	25	16
Sub-total	95		251		56		86		74		107		23		16		14		41	
Grand Total	Male = 470				Female = 293				Total = 763											

PSST = Proportionate stratified sampling technique CSSH = College of Social Science and Humanity CoE = College of Engineering CBE = College of Business and Economics CHSM = College of Health Sciences and Medicine CNCS = College of Natural and Computational Sciences COA = College of Agriculture SEBS = School of Education and Behavioral Sciences SoL = School of Law SVM = School of Medicine SoI = School of Law

2.3. Instruments for Data Collection

The self-developed instrument for measuring general information of the subjects consisted four items which provide information about sex, age, college and year level. The questionnaire included measure of social media usage developed by (Savita & Liyaqat, 2018) and Self-esteem Inventory developed by Rosenberg (Rosenberg, 1989).

2.4. Pilot Study

A pilot study was conducted to ensure that whether the instruments are suitable to be used within the university context and in order to establish their reliability. The pilot study was conducted by administering questionnaire to a group of 76 (10% of the actual sample) Arbamich University students who were not part of the main study. To test the reliability, SPSS version 20 Cronbach's alpha reliability was used.

Based on the pilot data collected, Cronbatch alpha reliability test of the instrument of both scale was measured and found to be sufficient as it is shown in table 2.

Table 2: Cronbach's Alphas Reliability for the Scales

Scale	Number of items	Reliability coefficient for original scale	Reliability coefficient of pilot study
Social Media Usage	17	.77	.81
Self-esteem	10	0.83	.70

2.5. Method of Data Analysis

- In this process, descriptive statistics (i.e. frequencies, percentage, mean, standard deviation) of the students was employed to describe and present demographic characteristics of the participants such as sex, age and year level, extent social media usage, status of self-esteem and purpose of social media usage.
- Independent T-test was computed to test whether there is a significant mean difference between male and female students in social media usage and students' self-esteem.
- Analysis of Variance (One Way ANOVAs) was computed to test whether there is a significant mean difference in age group and year level in terms of social media usage.
- In order to measure the relationship between the independent variables social media usage and the dependent variables students' self-esteem Pearson product moment correlation coefficient (*r*) was computed.

III. RESULTS

2.6. Demographic Characteristics of Respondents

Table 3: Demographic Characteristics of Respondents

Variables	Option	Frequency	Percent	
Sex	Male	470	61.6	
	Female	293	38.4	
	Total	763	100	
Age	18-21	584	76.5	
	22-25	164	21.5	
	26-29	15	2.0	
	Total	763	100	
Year level	First Year	Male	94	12.3
		Female	116	15.2
		Total	210	27.5
	Second Year	Male	91	11.9
		Female	95	12.5
		Total	186	24.4
	Third Year	Male	147	19.3
		Female	59	7.7
		Total	206	27.0
	Fourth Year	Male	72	9.4
		Female	14	1.9
		Total	86	11.3

Fifth Year	Male	66	8.6
	Female	9	1.2
	Total	75	9.8
Total		763	100

Table 3: depicted that out of the total 763 students of Wolaita Sodo University majority 470(61.6%) are male students and 293(38.4%) are female students.

Regarding the age of respondents 584 (76.5%) of students are found in the age category of 18-21 and 164 (21.5%) of students are found in the age group of 22-25. The rest 15 (2.0%) students are found in the age category of 26-29.

Regarding Year level of student 210 (27.5%) of students are first year students, 186 (24.4%) of students are second year students, 206 (27.0 %) of students are third year students, 86 (11.3%) of students are fourth year students and 75 (9.8%) of students are fifth year students. Therefore, majority of students are first year students followed by second year students.

2.7. Purpose of social media usage

Table 4: Purposes of Social Media Usage

Selected Frequencies Purposes of using Social Media	Responses		Percent of Cases
	N	Percent	
	To have entertainment.	478	
To have good relationships in touch with friends and family	498	21.5%	65.6%
To download, post, and look image and video.	464	20.0%	61.1%
To gain academic knowledge and new information.	472	20.4%	62.2%
To share my personal beliefs and other helpful idea	404	17.4%	53.2%
Total	2316	100.0%	305.1%

Table 4: showed the purpose of social media usage by using multiple response analysis. The purpose of social media usage by students vary from individual to individual because there are various types of social media and the preference and perceived importance by individuals may influence students’ choice of specific media.

In this study participant context, Wolaita Sodo University students’ purpose of social media usage is specified to the stated purpose in the Table 4. As indicated in the Table, out of 763 respondents, majority of participants which is 498(65.6%) responded that their purpose of social media usage was to have good relationships with others and in touch with friends and family followed by 478(63%) of respondents responded that the use social media for the purpose of entertainment. The rest respondents responded that to gain academic Knowledge, to download post and look images, and to share personal belief and other helpful idea i.e. 472 (62.2%), 464 (61.1%), 404 (18%) respectively. This indicated that majority of students’ using social media purposively to have good relationships and in touch with others particularly friends and family.

2.8. Extent of Social Media Usage by Students

To determine the extent of social media usage by Students, first mean score of the social media usage is computed and found to be 2.59. To determine social media usage of students as high or low, mean split was used, that is if the mean score of individual respondent is less than the overall mean score of social media usage, it is labeled as high and if the individual mean score is greater than overall mean score of social media usage, it is labeled as low. In other word those who scored a certain score bellow the mean were considered as high extent of social media usage and those who scored a certain score above the mean were considered as having low extent of social media usage. Therefore, frequency count and percentage value was computed for the total sample respondents. Finally, the extent of social media usage was computed in Table 5.

Table 5: Extent of Social Media Usage Summary

Variables	High Extent		Low Extent		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Social Media Usage	439	57.5	324	42.5	763	100

Table 5: indicates that 439 (57.5%) of students had high extent of social media usage and the rest 324 (42.5%) of students had low extent of social media usage. Therefore, majority of students had high extent in social media usage.

2.9. Status of Students' Self-esteem

To determine the status of adolescents positive functioning, first mean score of the Self-esteem was computed and found 2.13. To determine status of students' Self-esteem as high or low, mean split was used, that is respondents who scored a certain score above the mean of pre-determined Self-esteem was considered as high status and those who scored a certain score below the pre-determined mean was considered as having low status. Therefore, frequency count and percentage value was computed for the total sample respondents. Finally, the status of adolescents Self-esteem was computed in Table 6.

Table 6: Status of Adolescents self-esteem

Variables	High level		Low level		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Self-esteem	295	38.7	468	61.3	763	100

Table 6, indicated that 295 (38.7%) of students had high self-esteem and the rest 468 (61.3%) of students had low self-esteem, Therefore, it is possible to conclude that majority of students had low status of Self-esteem.

2.10. Sex and Social Media Usage

Independent – sample t – tests was conducted to compare social media usage of students' scores for males and females.

Table 7: Descriptive Statistics on Sex Difference in Terms of Social Media Usage

Group Statistics					
	Sex of Respondents	N	Mean	Std. Deviation	Std. Error Mean
Social Media Usage	male	470	2.7426	.80628	.03719
	female	293	2.3708	.49932	.02917

Table 8: Independent Sample t-test between Male and Female Respondents Regarding Social Media Usage

Independent Samples Test							
Levene's t-test for Equality of Means							
Test for Equality of Variances							
		F	Sig. t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
						95% Confidence Interval of the Difference	
						Lower	Upper
Social Media Usage	Equal variances assumed	78.974	.000	760.974	.000	.37174	.05244
	Equal variances not assumed	7.865	.007	760.974	.000	.37174	.04727

In Table 8, using an alpha level of 0.05, an independent sample t-test was conducted to compare the social media usage scores for males and females. The examination of social media usage score indicated that there was significant differences in scores for males ($M = 2.74, SD = 0.80$) and females ($M = 2.37, SD = 0.49$); $t(760.974) = 7.86, p < 0.05$, two-tailed). The magnitude of the differences in the means (mean difference = .37, 95% CI: ranged from .27 to .46) was medium (Cohen's $d = 0.58$). This indicated that male students use social media higher than that of female students.

2.11. Sex Differences in Terms of Self-esteem

Table 9: Descriptive Statistics on Sex Difference in Terms of Respondents Self-esteem

Group Statistics					
	Sex of Respondents	N	Mean	Std. Deviation	Std. Error Mean
Self-esteem	male	470	2.2004	.77545	.03577
	female	293	2.0177	.63679	.03720

**Table 10: Independent Sample t-test between Male and Female Respondents Regarding Self-esteem
Independent Samples Test**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	(2-Mean Difference)	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper	
Self-esteem	Equal variances assumed	15.932	.000	3.383	761	.001	.18268	.05399	.07668	.28867
	Equal variances not assumed			3.540	705.852	.000	.18268	.05161	.08135	.28400

In Table 10, using an alpha level of 0.05, an independent sample t-test was conducted to compare the self-esteem scores for males and females. The examination of self-esteem score indicated that there was significant differences in scores for males ($M = 2.20$, $SD = 0.77$) and females ($M = 2.01$, $SD = 0.63$); $t(705.856) = 3.54$, $p < 0.05$, two-tailed). The 95% confidence interval for self-esteem ranged from 0.08 to 0.28. The magnitude of the differences in the means (mean difference = .18) Cohen's $d = 0.26$ which is small. This indicated that male students are better in their self-esteem than female students.

2.12. Age and Year Level Differences in Social Media Usage

Table 11: One-Way Analysis of Variance in Extent of Social Media Usage by Age Categories

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.078	2	1.039	1.971	.140
Within Groups	400.561	760	.527		
Total	402.638	762			

According to age category in the Table 11, analysis of variance showed no statistically significant difference at the $p > .05$ level in extent of social media usage for the three (18-21, 19-25 and 25-29) age categories: $F(2, 760) = 1.91$, $p = .140$, $\eta^2 = .005$. Therefore, the result showed that there is no difference in social media usage in terms of age category.

Table 12: One-Way Analysis of Variance in Extent of Social Media Usage by Year Level Categories

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.553	4	.638	1.209	.305
Within Groups	400.085	758	.528		
Total	402.638	762			

According to year level category in the Table 12, analysis of variance showed no statistically significant difference at the $p > .05$ level in extent of social media usage for the five year level categories of students: $F(4, 758) = 1.209$, $p = .305$, $\eta^2 = .006$. Therefore, the result showed that there is no difference in social media usage in terms of year level.

2.13. Relationship between Social Media Usage and Self-esteem

Table 13: Pearson Product-Moment Correlations of the Social Media usage and Self-esteem

		Social Media usage	Self-esteem
Social Media usage	Pearson Correlation	1	-.201
	Sig. (2-tailed)		.554
	N	763	763

According to Table 13, indicated that there is statistically insignificant and weak negative relationship between social media usage and students self-esteem ($r = -0.201$, $p > 0.05$). This indicated that as students' consumption of social media usage increases the probability of students' level of self-esteem decreases.

IV. DISCUSSION

2.14. Purpose of social media usage

In investigating the purpose of students social media usage, the current study result indicated that majority of study participants which is 498(65.6%) responded that their purpose of social media usage was to have good relationships with others and in touch with friends and family and followed by the use social media for the purpose of entertainment, to gain academic Knowledge, to download post and look images, and to share personal belief and other helpful idea in descending order. But, the current finding contradict with the finding of Metasebiya (2017) which stated the majority of students' reportedly claimed purpose of the usage of social media at Mekane Yesus Management and Leadership College was to gain academic knowledge and new information 59.4% and others like to know new idea that was not known before; to post and announce or promote work and events; to solve problems by sharing idea with friends that would get time to get solutions for him/herself; and to follow and share spiritual things. Another different finding is found by Wondimagegn (2017) which suggested that majority of students 31.2% utilize social media for entertainment purpose.

2.15. Extent of social media usage by students

In identifying the extent of Social media usage of Wolaita Sodo University Students the result revealed that majority 57.5% of students had high extent of social media.

The current finding is consistent with findings like Asemah et al. (2013) which stated that the exposure to social media is very high among the respondents and 68% of the respondents use social media to a very large extent in Nigeria. Similarity, Camilia et al. (2013) suggested that in the studies conducted in Negeria it was found that most of students of higher institutions use social media 2 to 4 hours daily, which can be labeled as high extent of usage.

2.16. Status of Students' Self-esteem

Assessment of students' Self-esteem was done and the result revealed that majority of students 61.3% of students had low self-esteem. Therefore, majority of students had low level in their Self-esteem. The current result is inconsistent with previous findings like Million (2017) found that majority 54.7% of high school students in Hawassa Tabour Secondary school had high level of Self-esteem. Similar inconsistent finding by Tadesse (2015) in measuring status of adolescent positive functioning among Entoto secondary school students, he found that majority which is 59.20% of students had high Self-esteem. Therefore, this clearly indicates that majority of university students in the study area context had low status of Self-esteem, which means majority of students lack value or worth that they place on themselves and their behavior.

2.17. Sex Difference in Social Media Usage

In the current research, the examination of social media usage in terms sex difference result revealed that male students use social media higher than that of female students. The result of this study is in line with findings of Thelwall (2008) and Lenhart & Madden (2007) which stated that males tend to make new relationship in social network environments more than females do which pushes them to use social Medias more than that of female.

However, the current study result is inconsistent with (Lenhart, 2007) finding which says, Studies in the United States have also shown that there are gender differences in social media usage. A large study conducted in 2007 found that Instagram and Snapchat are dominated by girls in the United States with 61% of girls using Instagram compared to 44% of boys and 51% of girls using Snapchat compared to 31% of boys. Another contradiction with current study finding is, researchers like Misra, Dangi & Patel (2015) and Tüfekçi's (2008) which stated that females are more prone to Social media sites as compared to males and spend more hours daily on the Social media sites.

2.18. Sex Difference in terms of self-esteem

The current study examination of sex difference in terms of self-esteem indicated that there was significant difference between male and females University students in their self-esteem in the study area context. That is male students better in their self-esteem than female students. This finding is consistent with previous findings Quatman and Watson (2001) which investigated gender differences in global self-esteem and eight domains of self-esteem among adolescents from 9th, 10th and 12th grade students. Their study showed that boys achieved higher in global self-esteem scores than girls did. In addition, boys scored significantly higher than girls in six domains of self-esteem (personal security, home/parents, Attractiveness or physical appearance, personal mastery, psychological reactivity/permeability, and athletics) while the remaining two domains (perception of peer popularity and academics) exhibited no significant differences between males and females. Therefore, the review shows that male adolescents do have higher self-esteem as compared to their female counter parts.

On the other hand, contradictory findings are suggested by Million (2017) which stated that there was no sex difference in self-esteem among students of Hawassa Tabor secondary and preparatory students.

2.19. Age and Year Level Differences in Social Media Usage

In the current study result in order to know Age difference in social media usage, One way ANOVA was conducted and the result showed that there was no significant difference in social media usage in terms of age category among Wolaita Sodo University students. The present study is consistent with Metasebiya (2017) study which suggested that there was no difference in age category among college students in terms of age. But Wondimagegn (2017) do not supported the present study finding which indicated that there are

significant differences among the age categories for the frequency of social media usage among students. That means the respondents in the age category between 19 to 21 years old were likely to use social media sites frequently than the other age groups. Similarly, the findings of the present study seems contrary to the results of a study by Lenhart & Madden (2007) which reported that 73% of teens between the ages of 12 and 17 they are the one that oversee frequently their social media sites frequently than the other age groups. In the present study, In terms of year level difference in social media usage analysis of variance result indicated that there was no significant difference in social media usage in terms of year level among Wolaita Sodo University students.

In line with the current study Wondimagegn (2017) found that class year level doesn't matter with students' utilization of social media sites per week in school of informatics at Hawassa University.

However, the present study result contradict with Metasebiya (2017) study which suggested that there is difference in social media usage in year level among Addis Abeba Mekane yesus college students.

2.20. Relationship between Social Media Usage and Self-esteem

In investigating the relationship between social media usage and students' self-esteem, the result of Pearson product momentum correlation coefficient indicated that there is negative week relationship between social media usage and students' self-esteem even though the relationship is insignificant. Therefore, it is possible to say that as consumption of social media usage increases the level of self-esteem of students adversely affected.

The current study finding is in line with Pantic (2014) study which argued that anxiety, depression, psychotic disorders and low self-esteem are all the results of social networking sites, especially Facebook. Similarly, Chou and Edge (2012) finding suggested that people who use Facebook frequently have a very strong belief that other users, who they don't know very well offline, are living a very healthy, happy and prosperous life than themselves. These assumptions about other peoples' lives cause depression and low self-esteem amongst individuals. Chen & lee (2013) also argued that Facebook usage is directly related to psychological distress of individuals which as a result reduces the self-esteem of people.

In contrary to the present study, Ellison, Steinfield and Lampe (2007) found out that youngsters with low self-esteem find Facebook more beneficial as compared to the ones with high self-esteem. Additional inconsistent finding argue that due to the use of Facebook people with low self-esteem possess more social capital than the ones with high self-esteem (Tazghini & Siedlecki, 2013).

V. CONCLUSION

From the study results obtained, the researcher concluded the following important points.

- Among Wolait Sodo University students the major purpose of social media usage was identified that in order to have good relationships with others and in touch with friends and family followed by to have entertainment. This imply that students gives more preference for relationship and entertainment than other purposes of social media i.e., gaining academic Knowledge, downloading posts and look images, and sharing personal belief and other helpful idea.
- The extent of Social media usage of Wolaita Sodo University Students was found to be high. This indicated that students spend a lot of time on social media and use social media for various purposes.
- In Wolait Sodo University, majority of students had low status of self-esteem. This may considerably influence students' sense of worthy and confidence on themselves.
- Sex difference in social media usage revealed that male students use social media higher than that of female students. This imply male students tend to make new relationship in social network environments more than females do which pushes them to use social Medias more than that of female.
- The examination of sex difference in terms of self-esteem indicated that there was significant difference between male and females university students in their self-esteem. Therefore in the study area context it is possible to conclude that male students have higher self-esteem than female students in experiencing sense of self-worth or value. This could be due to the different cultural and traditional barriers that girls face in their development in Ethiopian context.
- In investigating age and year level difference in social media usage, one way analysis of variance is conducted and the result showed that there is no significant difference in age group as well as in year level among Wolaita Sodo University students.
- The study examined the relationship between social media and student self-esteem and it was found that the relationship is weak negative and insignificant. That is there is inverse relationship between social media usage and self-esteem.

VI. RECOMMENDATION

Based on the findings the researcher forwarded the following recommendations:

- Students are advised to give much focus on academic social medias sites which are social networking sites that provides academic knowledge and information, than using social medias for building relationship and entertainment, as they are university students in addition to relationship and entertainment they better to use social media for additional important purposes like to enhance their academic performance, getting information which can improve their quality of life and personality.

- While using social media students better to recognize the negative influence of social media on self-esteem which would help them to work on how to identify social media sites that deteriorate their self-esteem.
- Students' habit of social media usage better to be minimized as it was found that their extent of social media usage was high, unless this habit may adversely affect many aspect of students life including their academic performance.
- Awareness raising programs on how and what to use on social media in the context of university students is better to be developed and implemented by government and non-government organization.
- Wolaita Soda University better to work with students on improving students' self-esteem through working with the university psychologists on how to improve students' self-esteem, provision of trainings like Life skill training, peer education training, inviting known motivational speakers etc. During this training program female students should be center of attention.

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Development And Validation Of Stability Indicating Rp-HPLC Method For The Estimation Of Valganciclovir In Bulk And Pharmaceutical Dosage Form

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DOI: 10.29322/IJSRP.10.09.2020.p10511

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10511>

Abstract- A simple, Precise, Accurate method was developed for the estimation of Valganciclovir by RP-HPLC technique. Chromatographic conditions used are stationary phase Ascentis 150mm x 4.6 mm, 5.0 μ , Mobile phase 0.01N potassium dihydrogenphosphate: Methanol in the ratio of 65:35 and flow rate was maintained at 0.8ml/min, detection wave length was 254nm, column temperature was set to 30oC, retention time 2.180min. System suitability parameters were studied by injecting the standard six times and results were well under the acceptance criteria. Linearity study was carried out between 25% to150 % levels, R² value was found to be as 0.999. Precision was found to be 0.8 for repeatability and 0.4 for intermediate precision.LOD and LOQ are 0.0542 μ g/ml and 0.1643 μ g/ml respectively. By using above method assay of marketed formulation was carried out 99.8% was present. Degradation studies of Valganciclovir were done, in all conditions purity threshold was more than purity angle and within the acceptable range. This method can be used for routine analysis of Valganciclovir.

Index Terms- HPLC Valganciclovir, Method development. ICH Guidelines

I. INTRODUCTION

Valganciclovir is an anticoagulant and the first orally active direct factor Xa inhibitor. Unlike warfarin, routine lab monitoring of INR is not necessary. However there is no antidote available in the event of a major bleed. Only the 10 mg tablet can be taken without regard to food. The 15 mg and 20 mg tablet should be taken with food. FDA approved on July 1, 2011^[1].

The chemical name of Valganciclovir is 5-chloro-N-[[[(5S)-2-oxo-3-[4-(3-oxomorpholin-4-yl)phenyl]-1,3-oxazolidin-5-yl]methyl]thiophene-2-carboxamide. The molecular formula of Valganciclovir C₁₉H₁₈CIN₃O₅S.

The main objective of this proposed method is to develop a new rapid, simple, precise, accurate and economical analytical method for the estimation of Valganciclovir ^[2].

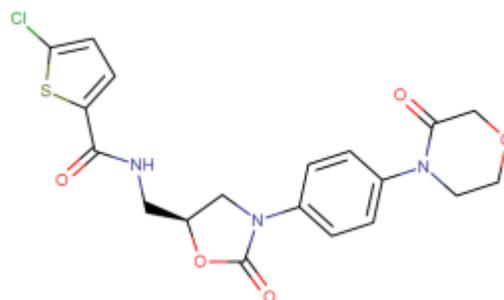


Figure 1: structure of Valganciclovir

II. MATERIALS AND METHODS

Pharmaceutical grade Valganciclovir was purchased from Spectrum Labs. The solvents used for the procedure are of analytical grade. The HPLC grade chemical used is methanol and double distilled water and they were obtained from SDFCL. All the solutions were filtered through vacuum filter and sonicated. The marketed formulation of Valganciclovir(Valgan) is obtained from Cipla Pharma India Limited ^[3].

Apparatus:

U.V. Visible double beam spectrophotometer shimadzu along with two matched cuvetts was used. Stock solutions of the samples were prepared in AR grade methanol and used for analysis. The HPLC system used is waters HPLC model 2695. The column used was sunsil C18 (150mm X 4.6mm, 5 μ). Auto sampler 171 Plus and the detector consisting of waters dual λ absorbance detector operated at 254nm. Software used for HPLC is empower 3.0.

Chromatographic conditions:

As the drug is soluble in methanol, the experimentation was started with the mobile phase 0.01N Potassium dihydrogen Ortho phosphate : methanol water with 65:35, and tried at different levels of combination containing these solvents. The optimal composition of mobile phase was determined as 0.01N Potassium dihydrogen Ortho phosphate : methanol water with 65:35. The mobile phase was filtered through 0.45 μ m nylon filter, and then sonicated for at least 10min^[4].

III. STANDARD STOCK SOLUTION:

Accurately Weighed and transferred 45mg Valganciclovir working Standard into a 100 ml clean dry volumetric flask, add 70ml of diluent, sonicated for 30 minutes and make up to the final volume with diluents. From the above stock solution, 1 ml was pipeted out in to a 10ml Volumetric flask and then make up to the final volume with diluent. 10 tablets were weighed 45 μ g/ml the average weight of each tablet is equivalent to 1 tablet was transferred into a 100 ml volumetric flask, 5ml of diluent added and sonicated for 30 min, further the volume made up with diluent and filtered. From the filtered solution 0.5ml was pipette out into a 50 ml volumetric flask and made up to 50ml with diluent. Inject the samples by changing the chromatographic conditions and record the chromatograms [5].

Validation of RP-HPLC method for Valganciclovir in bulk drug:

Preparation of solutions:

Preparation of 11.25 μ g/ml solution:

0.25ml each from two standard stock solutions was pipetted out and made up to 10ml. (11.25 μ g/ml of Valganciclovir)

Preparation of 22.5 μ g/ml solution:

0.5ml each from two standard stock solutions was pipetted out and made up to 10ml. (22.5 μ g/ml of Valganciclovir).

Preparation of 33.75 μ g/ml solution:

0.75ml each from two standard stock solutions was pipetted out and made up to 10ml. (33.75 μ g/ml of Valganciclovir).

Preparation of 45 μ g/ml solution:

1.0ml each from two standard stock solutions was pipetted out and made up to 10ml. (45 μ g/ml of Valganciclovir)

Preparation of 56.25 μ g/ml solution:

1.25ml each from two standard stock solutions was pipetted out and made up to 10ml. (56.25 μ g/ml of Valganciclovir)

Preparation of 67.5 μ g/ml solution:

1.5ml each from two standard stock solutions was pipetted out and made up to 10ml. (67.5 μ g/ml of Valganciclovir)

Calibration curve (linearity):

The standard solutions were prepared by dilution of stock solution with methanol in concentration range 11.25 μ g/ml, 22.5 μ g/ml, 33.75 μ g/ml, 45 μ g/ml, 56.25 μ g/ml and 67.5 μ g/ml with concentration on X- axis and absorbance on Y- axis at 225nm. The correlation coefficient for Valganciclovir was found to be 0.999 [6].

Precision:

Precision of the analytical method was determined by taking 1ml of Valganciclovir stock solution was pipetted out and taken into a 10ml volumetric flask and made up with diluent. (45 μ g/ml of Valganciclovir) This solution of Valganciclovir was analyzed in HPLC for six replicates at the selected wavelength 254nm [7].

Accuracy:

Accuracy of the method was determined by recovery experiments. To the formulations the reference standard were added at the level 50%, 100%, and 150%. Accurately weighed 45mg of Valganciclovir transferred 100ml and volumetric flasks, 3/4 Th of diluents was added and sonicated for 10 minutes. Flasks

were made up with diluents and labeled as Standard stock solution (450 μ g/ml of Valganciclovir). 0.25ml of sample stock solution was taken into a 10ml volumetric flask, to that 1.0ml from each standard stock solution was pipetted out, and made up to the mark with diluent to get 50%. 0.5ml of sample stock solution was taken into a 10ml volumetric flask, to that 1.0ml from each standard stock solution was pipetted out, and made up to the mark with diluent to get 100%. 0.75ml of sample stock solution was taken into a 10ml volumetric flask, to that 1.0ml from each standard stock solution was pipetted out, and made up to the mark with diluent to get 150%. The recovery studies were carried out three times and the percentage recovery and percentage standard deviation of the recovery for Valganciclovir was calculated [8].

Robustness:

It is a measure of its capacity to remain unaffected by small, but deliberate variations in method parameters and provides an indication of its reliability during normal usage. Standard 10g/ml solution was prepared by taking 1ml from solution B and transferred into 10ml volumetric flask and the volume was made up to the mark with methanol(10 μ g/ml) and this solution was scanned at two different flow rates i.e., 0.7ml and 0.9ml [9].

Limit of detection (LOD) and Limit of quantification (LOQ):

The LOD and LOQ were separately determined and calculated based on the calibration curve of standard solution [10].

Degradation studies:

Oxidation:

To 1 ml of stock solution of Valganciclovir , 1 ml of 20% hydrogen peroxide (H₂O₂) was added separately. The solutions were kept for 30 min at 600c. For HPLC study, the resultant solution was diluted to obtain 45 μ g/ml solution and 10 μ l were injected into the system and the chromatograms were recorded to assess the stability of sample.

Acid Degradation Studies:

To 1 ml of stock s solution of Valganciclovir , 1ml of 2N Hydrochloric acid was added and refluxed for 30mins at 600c .The resultant solution was diluted to obtain 45 μ g/ml solution and 10 μ l solutions were injected into the system and the chromatograms were recorded to assess the stability of sample.

Alkali Degradation Studies:

To 1 ml of stock solution Valganciclovir , 1 ml of 2N sodium hydroxide was added and refluxed for 30mins at 600c. The resultant solution was diluted to obtain 45 μ g/ml solution and 10 μ l were injected into the system and the chromatograms were recorded to assess the stability of sample.

Dry Heat Degradation Studies:

The standard drug solution was placed in oven at 1050c for 1 h to study dry heat degradation. For HPLC study, the resultant solution was diluted to 45 μ g/ml solution and 10 μ l were injected into the system and the chromatograms were recorded to assess the stability of the sample.

Photo Stability studies:

The photochemical stability of the drug was also studied by exposing the 450µg/ml solution to UV Light by keeping the beaker in UV Chamber for 1hrs or 200 Watt hours/m² in photo stability chamber. For HPLC study, the resultant solution was diluted to obtain 45µg/ml solutions and 10 µl were injected into the system and the chromatograms were recorded to assess the stability of sample.

Neutral Degradation Studies:

Stress testing under neutral conditions was studied by refluxing the drug in water for 1hrs at a temperature of 60°C. For HPLC study, the resultant solution was diluted to 45µg/ml solution and 10 µl were injected into the system and the chromatograms were recorded to assess the stability of the sample.

IV. RESULTS AND DISCUSSIONS:

The present study was performed to develop a rapid precise and accurate method of Valganciclovir using RP-HPLC in bulk drug. The optimized chromatographic conditions were maintained using sunsil C18 column (250 X 4.6mm, 5µm) and mobile phase 0.01N potassium dihydrogenphosphate: Methanol in the ratio of 65:35 with a flow rate of 1ml/mi at UV detection 254nm. The retention time of Valganciclovir was found to be 2.180 min^[11].

**1. Precision:
Intraday precision:**

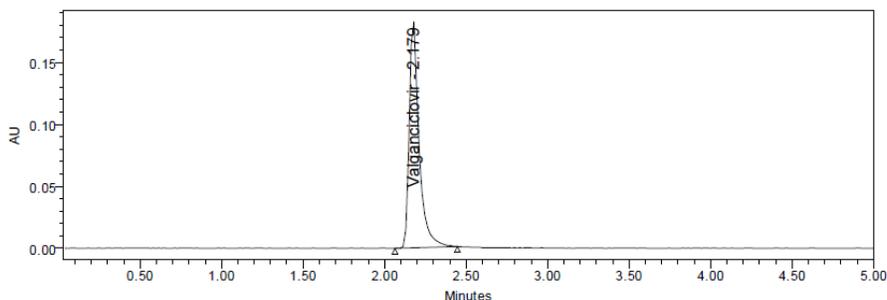


Fig-1.1: intra precision injection 1

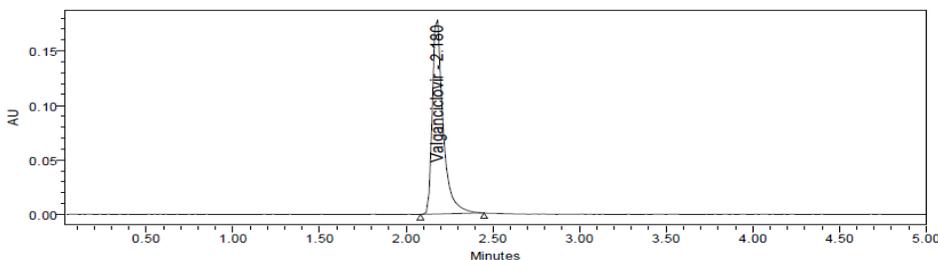


Figure 1.2: intraday precision injection 2

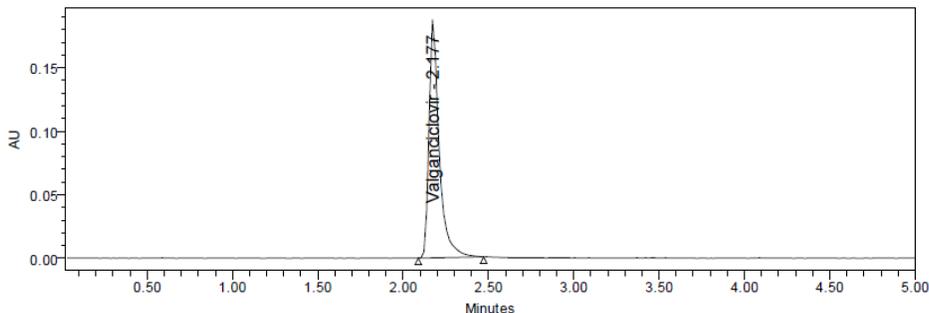


Figure 1.3: intraday precision injection 3

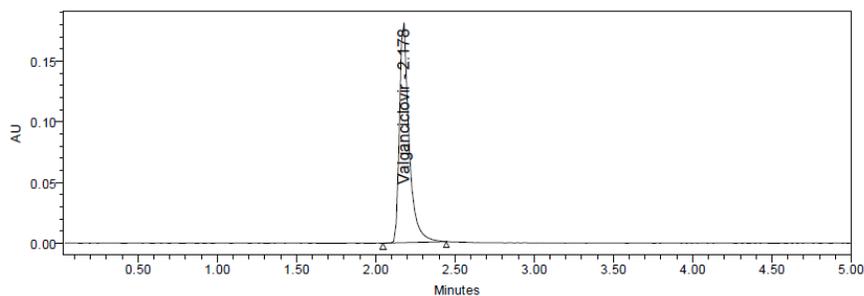


Figure 1.4: intraday precision injection 4

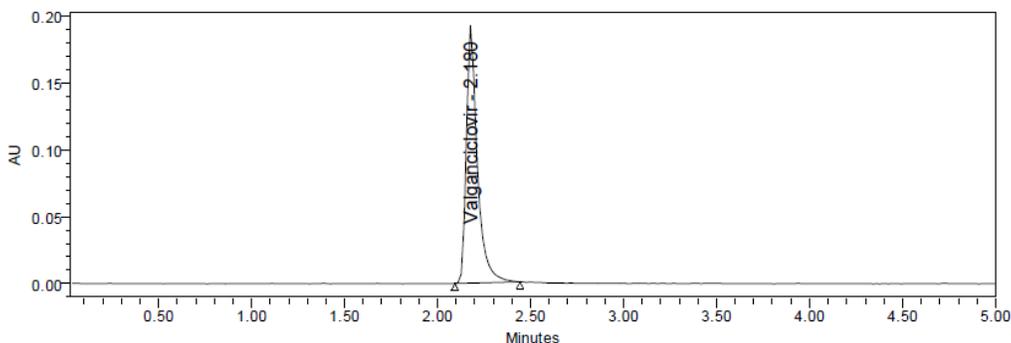


Figure 1.5: intraday precision injection 5

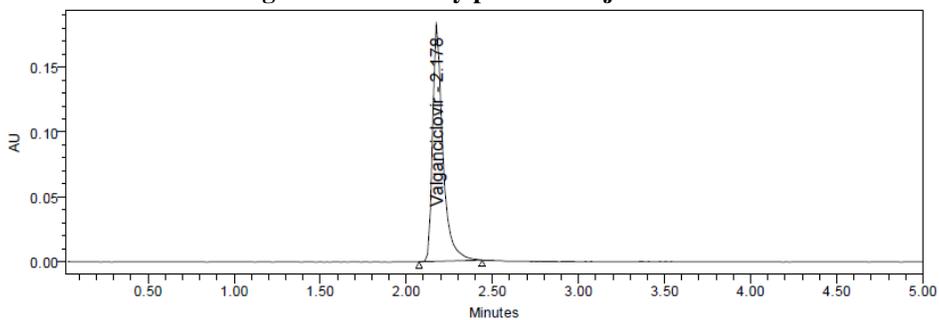


Figure 1.6: intraday precision injection 6

Table 1.1: Intraday precision results

S.No	Name	Rt	Peak area	Theoretical plate count	USP tailing
1	Valganciclovir(45µg/ml)	2.179	766317	4506	1.4
2	Valganciclovir(45µg/ml)	2.180	763941	4674	1.3
3	Valganciclovir(45µg/ml)	2.177	752415	4549	1.2
4	Valganciclovir(45µg/ml)	2.178	766353	4349	1.3
5	Valganciclovir(45µg/ml)	2.179	769865	4503	1.2
6	Valganciclovir(45µg/ml)	2.180	759417	4680	1.3
	%RSD		0.8		

Precision interday:

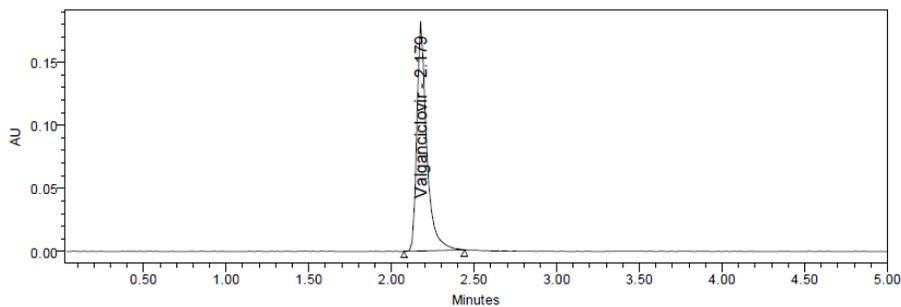


Fig 1.7: interday precision injection 1

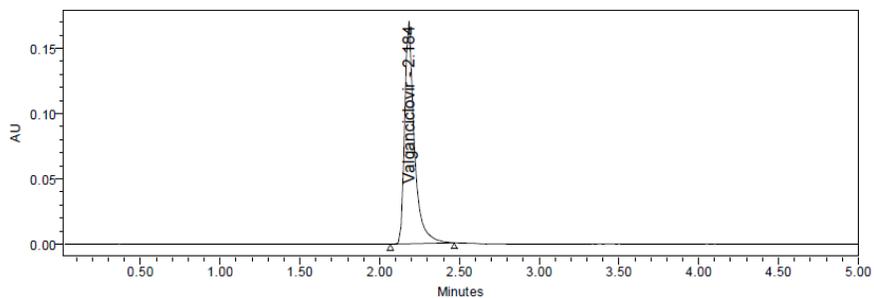


Fig 1.8: interday precision injection 2

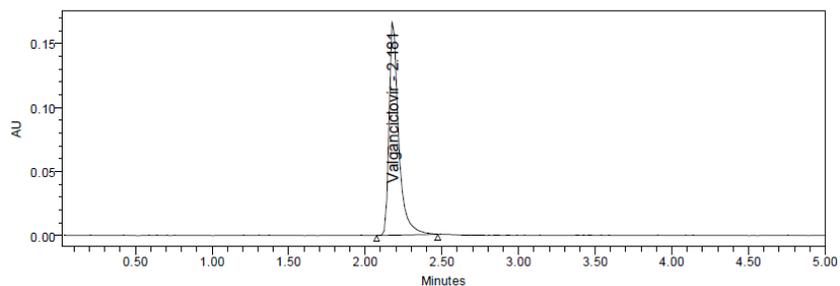


Fig 1.9: interday precision injection 3

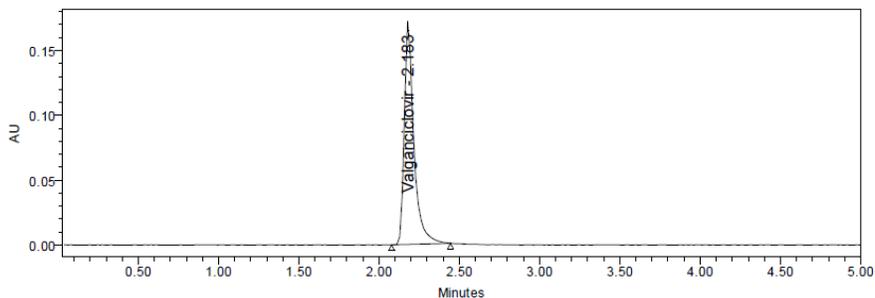


Fig 1.10: interday precision injection 4

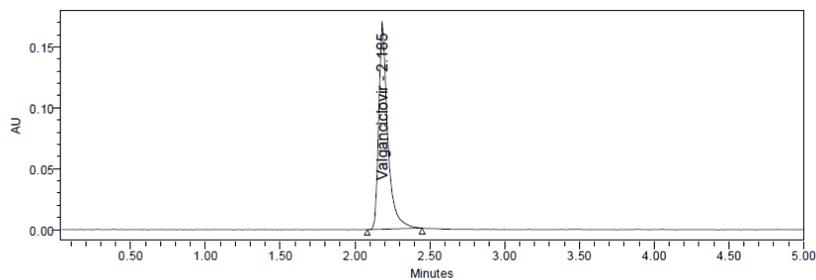


Fig 1.11: interday precision injection 5

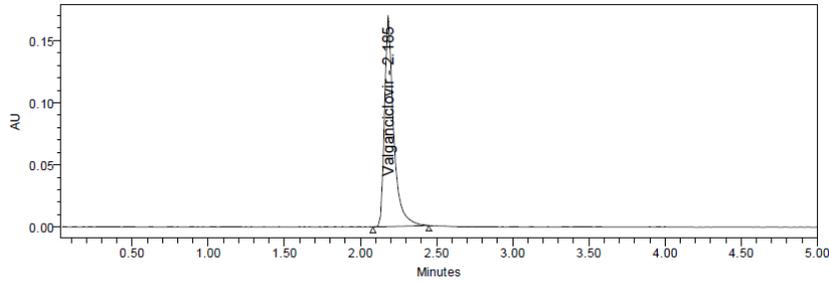


Fig 1.12: interday precision injection 6

Table 1.2: precision interday results

S.No	Name	Rt	Peak area	Theoretical plate count	USP tailing
1	Valganciclovir(45µg/ml)	2.1 79	747245	4506	1.2
2	Valganciclovir(45µg/ml)	2.1 84	745461	4674	1.3
3	Valganciclovir(45µg/ml)	2.1 81	740508	4549	1.2
4	Valganciclovir(45µg/ml)	2.1 83	743757	4349	1.3
5	Valganciclovir(45µg/ml)	2.1 85	739776	4503	1.2
6	Valganciclovir(45µg/ml)	2.1 85	740304	4680	1.3
	%RSD		0.4		

2. Linearity:

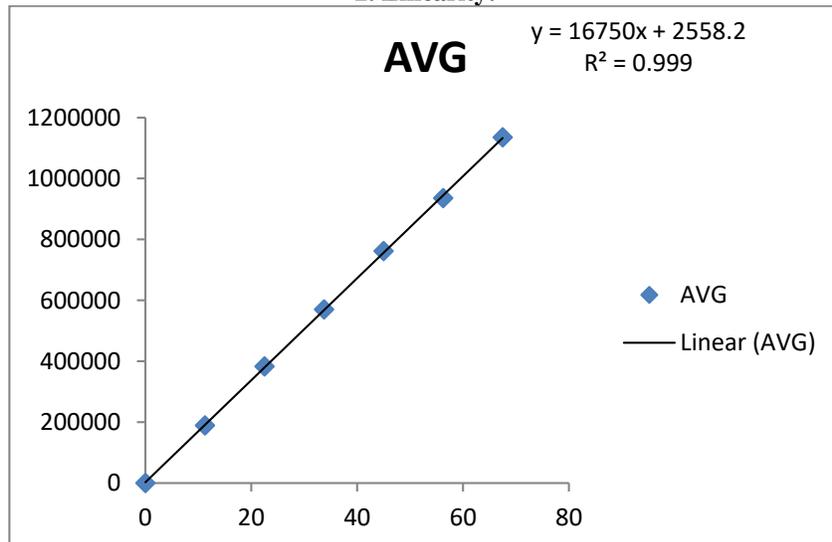


Figure 2: linearity

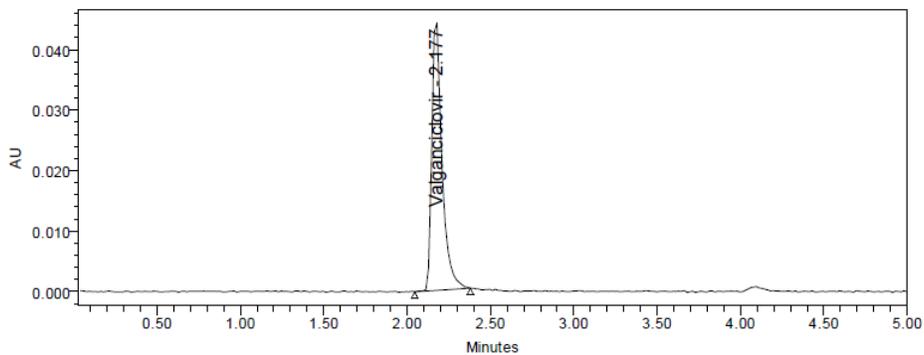


Figure 2.1: linearity 11.25 μ g/ml

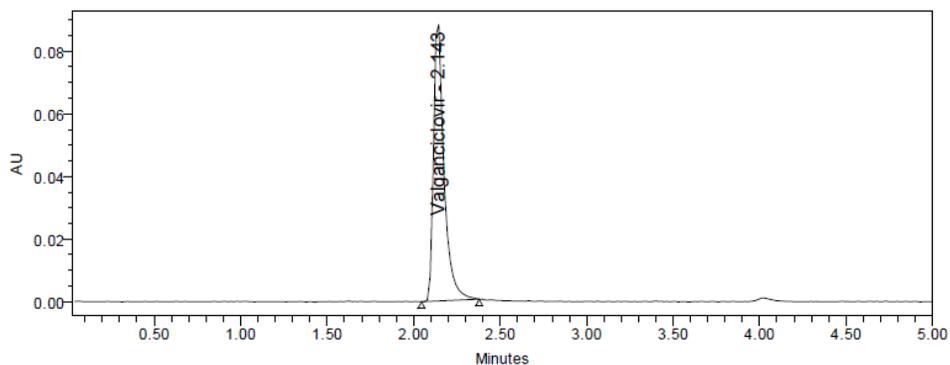


Figure 2.2: linearity 22.5 μ g/ml

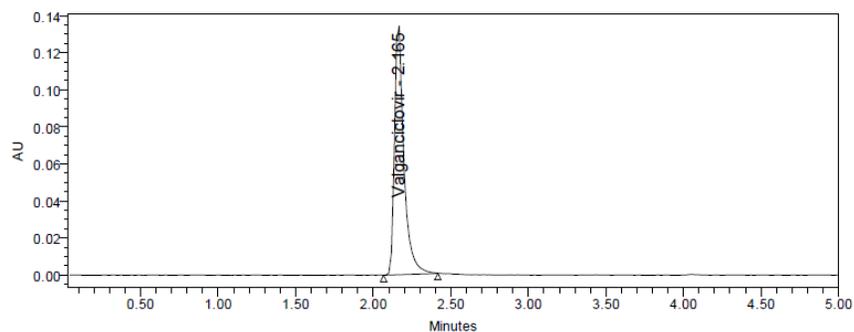


Figure 2.3: linearity 33.75 μ g/ml

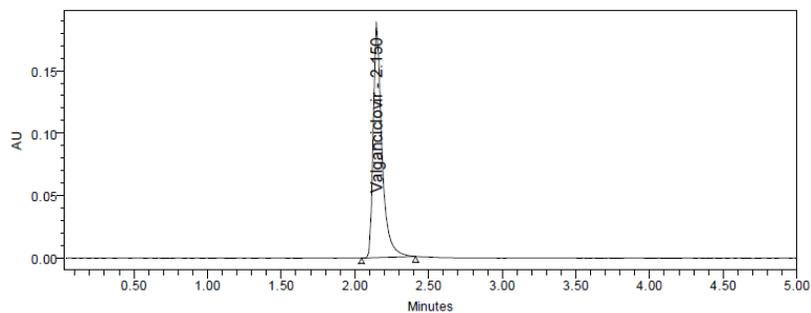


Figure 2.4: linearity 45 μ g/ml

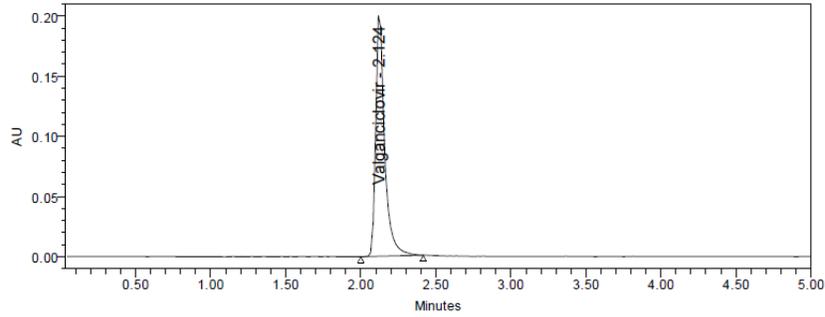


Figure 2.5: linearity 56.25 µg/ml

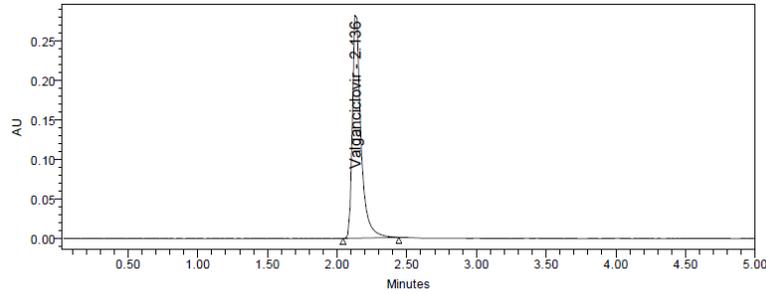


Figure 2.5: linearity 67.5µg/ml

Table 2.1: linearity results

S.No	Name	Linearity Level (%)	Rt	Area
1	Valganciclovir(11.25µg/ml)	25	2.1	189457
2	Valganciclovir(22.5 µg/ml)	50	2.1	383064
3	Valganciclovir(33.75µg/ml)	75	2.1	570179
4	Valganciclovir(45µg/ml)	100	2.1	761587
5	Valganciclovir(56.25µg/ml)	125	2.1	935600
6	Valganciclovir(67.5µg/ml)	150	2.1	1135097

3. Accuracy:

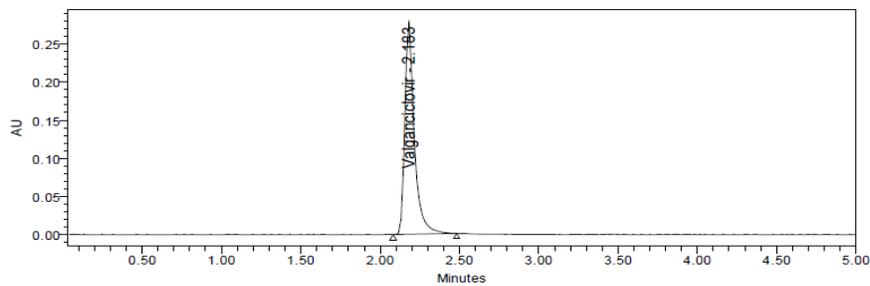


Figure 3.1: accuracy 50% injection 1

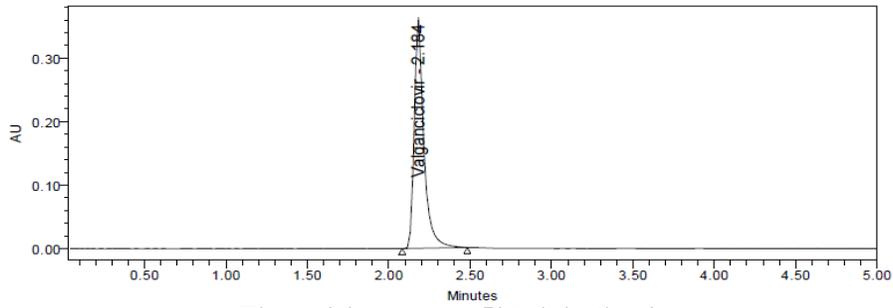


Figure 3.2: accuracy 50% injection 2

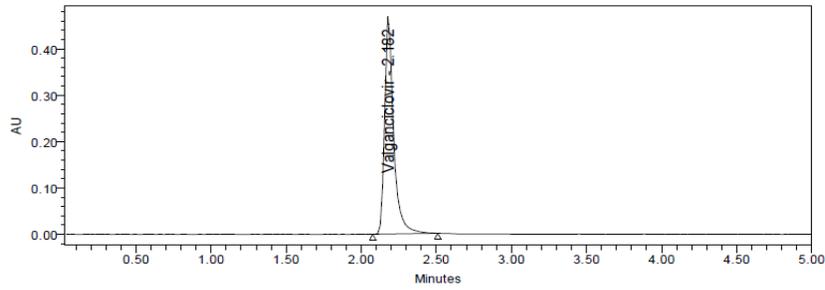


Figure 3.3: accuracy 50% injection 3

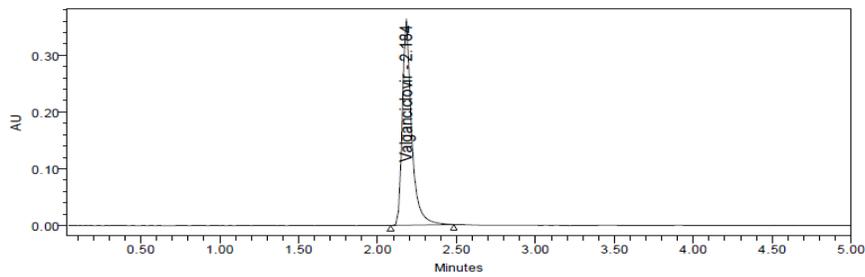


Figure 3.4: accuracy 100% injection 1

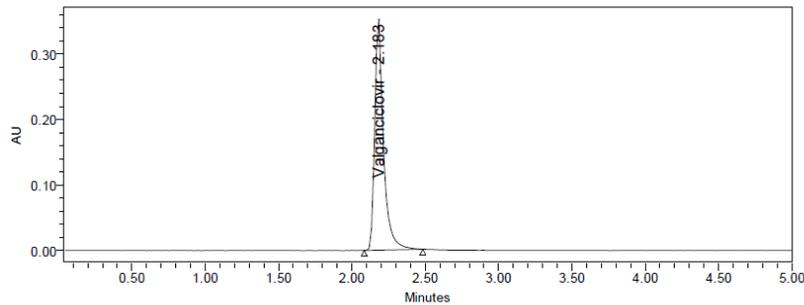


Figure 3.5: accuracy 100% injection 2

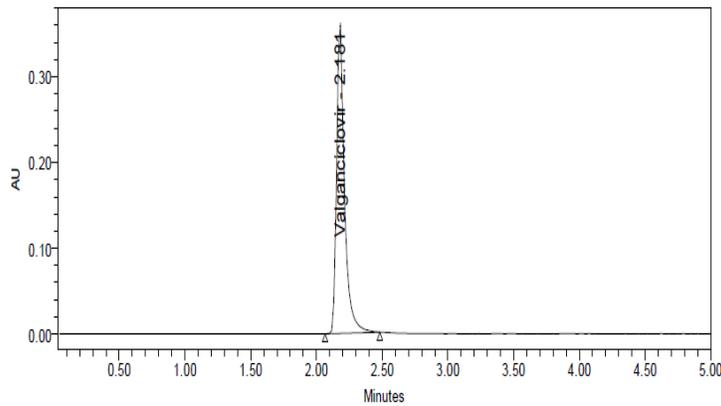


Figure 3.6: accuracy 100% injection 3

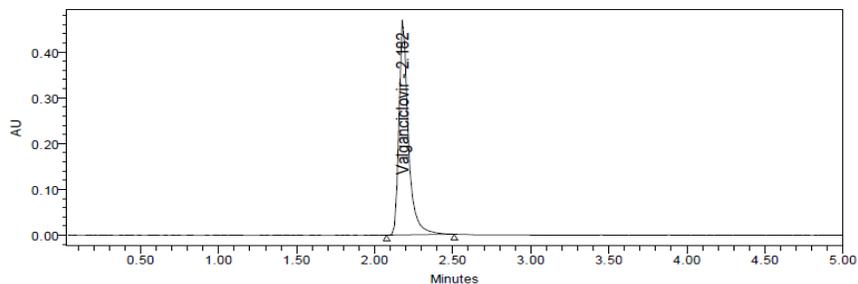


Figure 3.7: accuracy 150% injection 1

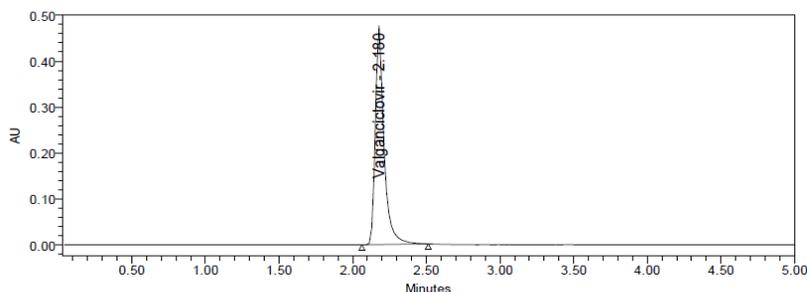


Figure 3.8: accuracy 150% injection 2

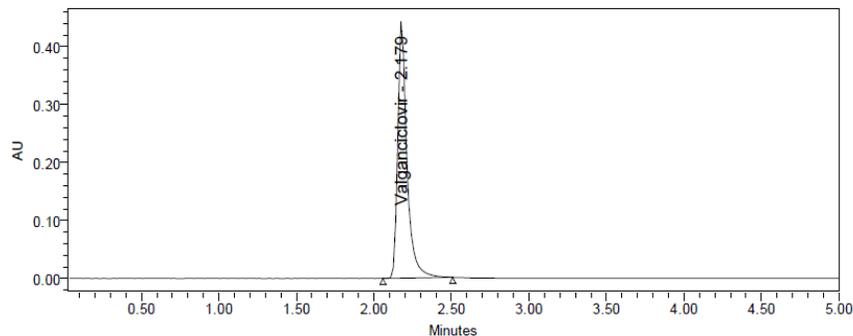
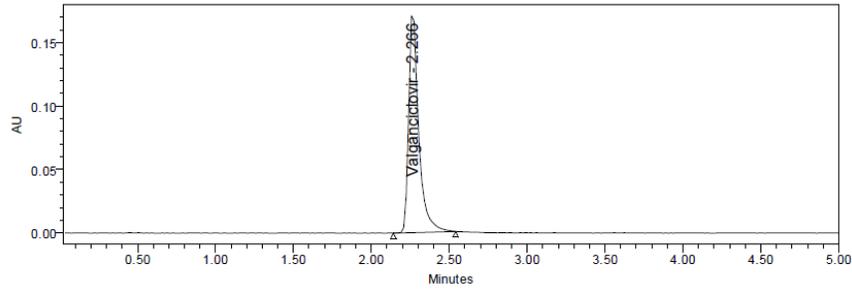


Figure 3.9: accuracy 150% injection 3

Table 3.1: accuracy results

% Level	Amount Spiked (µg/mL)	Amount recovered (µg/mL)	% Recovery	Mean %Recovery
50%	22.5	22.57	100.32	100.26%
	22.5	22.54	100.16	
	22.5	22.29	99.06	
100%	45	45.38	100.85	
	45	44.96	99.91	
	45	45.04	100.10	
150%	67.5	67.57	100.11	
	67.5	68.66	101.72	
	67.5	67.56	100.09	

4. Robustness:



[1] **Figure 4.1: Flow minus Chromatogram of Valganciclovir injection 1**

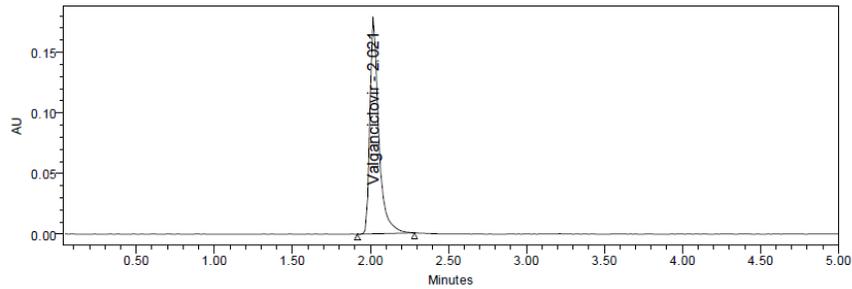


Figure 4.2: Flow plus Chromatogram of Valganciclovir injection 2

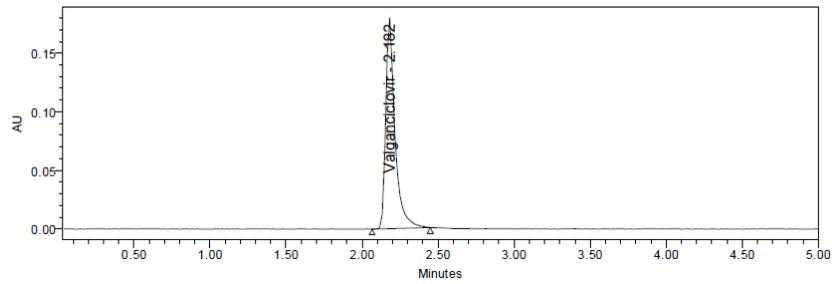


Figure 4.3: Mobile phase plus Chromatogram of Valganciclovir injection 1

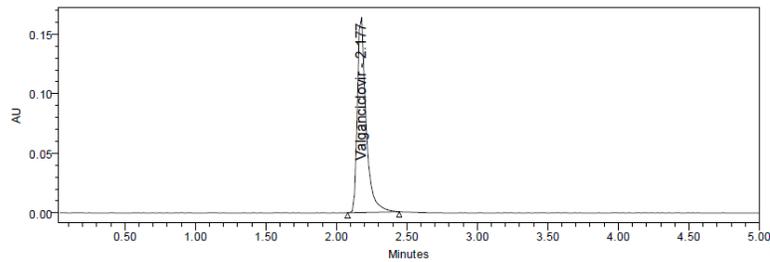


Figure 4.4: Mobile phase minus Chromatogram of Valganciclovir injection 2

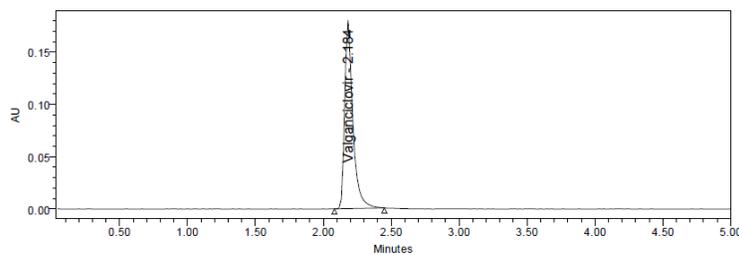


Figure 4.5: Temperature plus Chromatogram of Valganciclovir injection 1

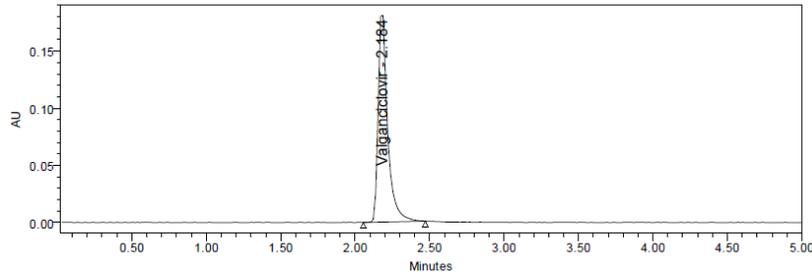


Figure 4.6: Temperature minus Chromatogram of Valganciclovir injection 1

Table 4.1: Robustness flow rate 0.9ml/min results

Parameter	Minus	Actual	Plus
Flow rate	0.7ml/min	0.8ml/min	0.9ml/min
Mobile phase	70B:30A	65B:35A	60B:40A
Temperature	25°C	30°C	35°C
Parameter	Minus	Actual	Plus
Flow rate	0.7ml/min	0.8ml/min	0.9ml/min

5. Limit of detection (LOD):

$$\begin{aligned}
 \text{LOD} &= 3.3 \times \sigma/s && (1) \\
 &= 3.3 \times 16754/2752.8 \\
 &= 0.542 \mu\text{g/ml}
 \end{aligned}$$

σ = standard deviation, s = slope of calibration curve

Limit of quantification (LOQ):

$$\begin{aligned}
 \text{LOQ} &= 10 \times \sigma/s && (2) \\
 &= 10 \times 16745/2363 \\
 &= 0.164 \mu\text{g/ml}
 \end{aligned}$$

σ = standard deviation, s = slope of calibration curve

Degradation Studies:

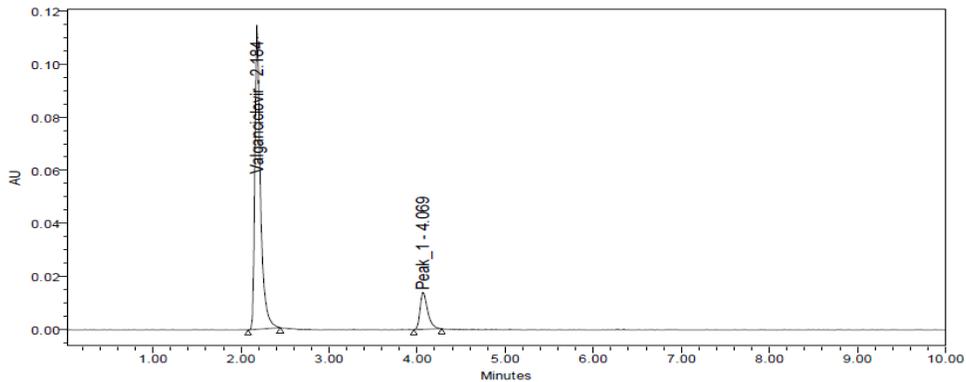


Figure 4.7: Acid degradation chromatogram of Valganciclovir

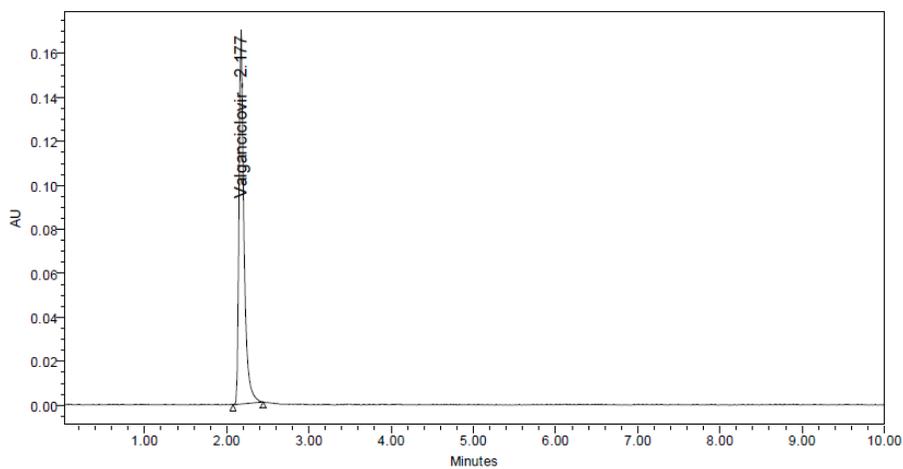


Figure 4.8: Base degradation chromatogram of Valganciclovir

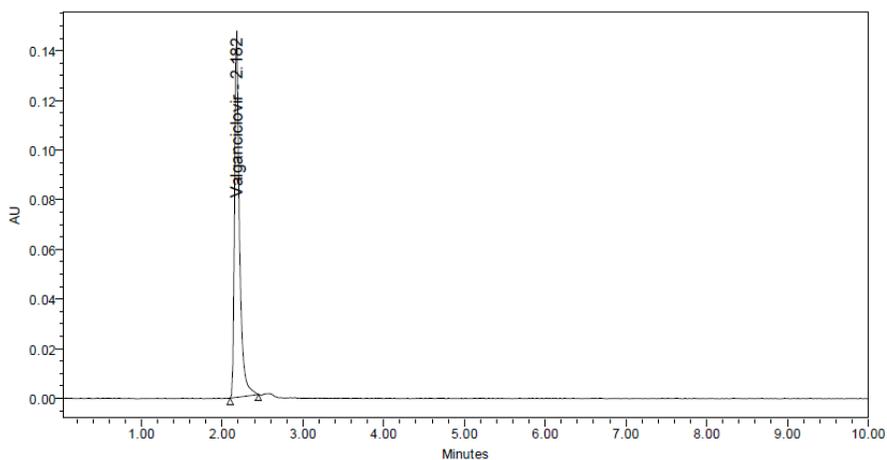


Figure 4.9: Peroxide degradation chromatogram of Valganciclovir

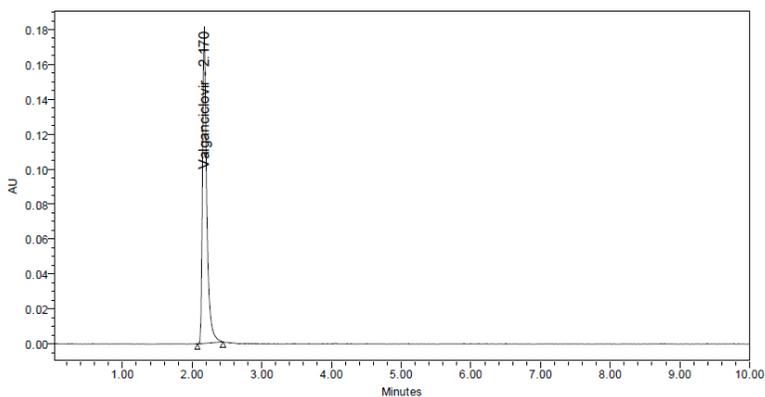


Figure 4.10: Thermal degradation chromatogram of Valganciclovir

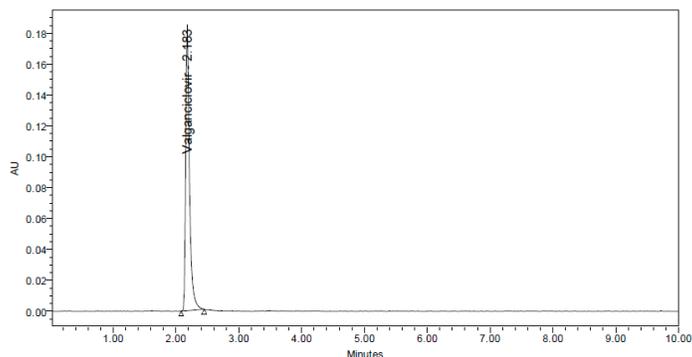


Figure 5.0: UV degradation chromatogram of Valganciclovir

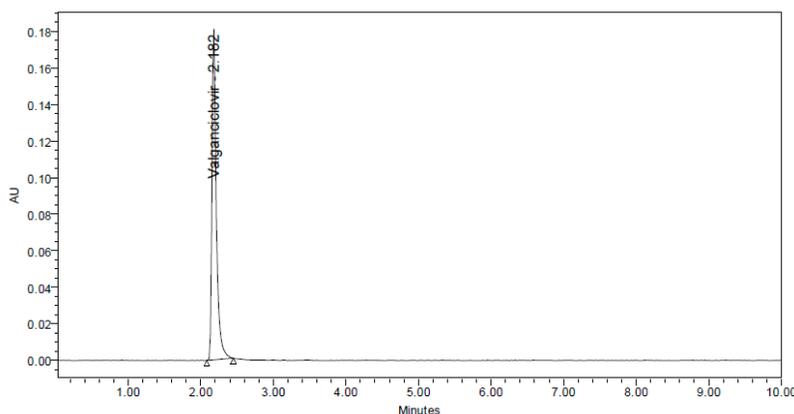


Figure 5.1: Water degradation chromatogram of Valganciclovir

V. CONCLUSION

Chromatographic conditions used are stationary phase Ascentis (150mm*4.6mm5.0m), Mobile phase 0.01N potassium dihydrogenphosphate: Methanol in the ratio of 65:35 and flow rate was maintained at 0.8ml/min, detection wave length was 254 nm, column temperature was set to 30C and diluent was mobile phase. Conditions were finalized as optimized method. System suitability parameters were studied by injecting the standard six times and results were well under the acceptance criteria. Linearity study was carried out between 25% to 150 % levels, R² value was found to be as 0.999. Precision was found to be 0.8 for repeatability and 0.4 for intermediate precision. LOD and LOQ are 0.0542µg/ml and 0.1643µg/ml respectively. By using above method assay of marketed formulation was carried out 100.52% was present. Degradation studies of Valganciclovir were done, in all conditions purity threshold was more than purity angle and within the acceptable range. Full length method was performed if it is done this method can be used for routine analysis of Valganciclovir.

A good sharp peak was eluted at 2.1min using potassium dihydrogenphosphate: Methanol (65:35) v/v as eluting solvents. All the system suitability parameters were found to be within limits. Therefore this method can be employed for routine laboratory analysis.

Extended study for the drug may include degradation studies by HPLC. Characterization by various hyphenated techniques using bio analytical methods.

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Resultant effect of pollution on soil properties and conservation of inhabiting fauna

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DOI: 10.29322/IJSRP.10.09.2020.p10512
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10512>

Abstract- This study investigated the impact of soil pollution on the physical and chemical properties of soil, and faunal richness. Soil samples at depths 0-5 cm, 5-10 cm and 10-15 cm were collected from five polluted sites over a period of twelve months (covering the dry and rainy seasons) for analysis in the laboratory. The nature of pollution in each site differed, ranging from domestic sources to agricultural inputs and industrial wastes. Soil samples from a fallowed plot were also collected in a similar manner for comparison of results. Soil fauna were extracted from the soil samples using the Berlese-Tullgren funnel in the laboratory. The organisms were sorted into separate taxonomic groups and members of each group were counted under a dissecting microscope. The physical (texture) and chemical (organic content and pH) properties of soil in polluted sites were determined following standard procedures and obtained values were compared with those from the fallowed plot. Faunal abundance varied significantly among sites ($P < 0.001$), soil depths ($P < 0.01$) and time of sampling ($P < 0.001$). A significantly higher number of soil fauna was found in the fallowed site, 0-5 cm soil depth and during the rainy season. Faunal species diversity was also richer in the fallowed plot in comparison to polluted locations. The soil texture, organic content and pH(CaCl₂) varied significantly among the six selected locations and their variation from control values was related to fluctuations in faunal abundance. Although metal residues were detected in all experimental sites, they were considered harmless to soil fauna because they were within the permissible range. The adverse effect of soil pollution on faunal conservation and some components of soil quality were highlighted, and erring nations were advised to emulate countries with effective pollution control measures.

Index Terms- Anthropogenic activities, Faunal conservation, Soil pollution, Soil quality, Species diversity

I. INTRODUCTION

The soil is a global resource covering the earth and serving as anchorage for plants and habitat for animals both above and below the ground. Thus, the state of health of the soil determines, to a large extent, the welfare of soil biota (Hervé et al., 2020; Kihara et al., 2020). Soil fauna are key players in several supporting and regulating ecosystem services and they comprise a large variety of animals, such as nematodes, earthworms and microarthropods e.g., mites, Collembola, Symphyla, Chilopoda, Pauropoda and enchytraeids (Dairo and Soyelu, 2017). In addition, a large number of meso- and macro-fauna species (mainly arthropods such as beetles, spiders, diplopods, chilopods and pseudoscorpions, as well as snails) live in the uppermost soil layers, the soil surface and the litter layer (Menta, 2012). The advent of industrial civilization with dependence on fossil fuel has increased the rate of soil disturbance significantly. This is in addition to the appreciable level of soil pollution that happens naturally (Rodríguez-Eugenio, 2018). Irrespective of the source of pollution, physical and chemical properties of soil could be altered and this often affects plants and animals associated with the soil adversely.

The main anthropogenic sources of soil pollution are the chemicals used in or produced as by-products of industrial activities, domestic, livestock and municipal wastes (including wastewater), agrochemicals, and petroleum-derived products. These chemicals are released to the environment accidentally, for example from oil spills or leaching from landfills, or intentionally, as is the case with the use of fertilizers and pesticides, irrigation with untreated wastewater, or land application of sewage sludge. Industrialization, wars, mining and intensification in agriculture have left a legacy of contaminated soils around the world (Luo et al., 2009; DEA, 2010; SSR, 2010; Bundschuh et al., 2012; EEA, 2014). As a result of rapid urban expansion, soil has been turned into a sink where solid and liquid wastes are dumped. Unfortunately, it was erroneously considered that once buried and out of sight, the contaminants would not pose any risk to man and his environment and that they would somehow disappear (Swartjes and Siciliano, 2012). This accumulation of wastes, eventually, constitutes the main source of soil pollution (Cachada et al., 2018) harming soil-dwelling organisms severely, thereby reducing faunal biodiversity and hampering major ecosystem services. Principal sources of heavy metals are coal and metal ore mining, chemical manufacturing, petroleum mining and refining, electric power generation, melting and metal refining, metal plating and to some extent domestic sewage (Gazso, 2001). At very low concentrations, heavy metals such as Cu, Ni and Zn are essential to plants and animals serving as components of enzymes, structural proteins, pigments and maintenance of ionic balance of cells (Kosolapov et al., 2004). However, at higher-than-normal levels, heavy metals constitute a serious threat to man and other forms

of biological life because of their toxicity, persistence and non-degradable conditions in the environment (Nwuche and Ugoji, 2008; Aina et al., 2009; Mohiuddin et al., 2010).

Soil pollution is a global scourge which requires active cooperation of every nation to overcome. The urgency to conserve soil fauna has continued to grow since the beginning of the millennium as highlighted in international environmental policies such as the Biodiversity Action Plan for Agriculture (EU 2001), the Kiev Resolution on Biodiversity (EU/ECE 2003) and the EU Soil Thematic Strategy of 2006. Unfortunately, most developing countries still have inadequately formulated and poorly implemented waste management guidelines which are not able to complement efforts of compliant nations. This study was, therefore, carried out to highlight the potential danger of five possible sources of soil pollution that are commonly encountered in a representative country, Nigeria. The relationship between soil pollution and faunal diversity, species abundance and soil properties were established. It is expected that results from this and other related studies would be found useful by appropriate authorities to initiate necessary legislative actions in erring nations.

II. MATERIALS AND METHODS

1. Collection of soil samples and extraction of fauna

Soil samples were collected from five sites (Table 1) that were purposely selected for specific form of pollution while a fallowed plot was chosen for comparison of results. One of the sites had been continuously cultivated with maize (*Zea mays* L.) for over ten years with frequent NPK and Urea fertilizer application while another site had been similarly cultivated with cowpea (*Vigna unguiculata* (L.) Walp.) that required frequent pesticide application. Soil samples were collected monthly from the six sites over a period of twelve months using standard procedures and equipment. In each site, a 15 cm × 15 cm micro plot was marked out each month from which soil samples were collected using a soil auger at 0-5 cm, 5-10 cm and 10-15 cm soil depths. Each soil sample was carefully sealed in a polythene bag and taken to the laboratory. Soil fauna were extracted from collected samples using the Berlese-Tullgren funnel as described by Dairo and Soyelu (2017). The soil samples were placed in the funnel for 72 h and escaping soil fauna were collected in basal plastic vials containing 70% ethanol. Established identification keys were used to sort the extracted organisms into different taxonomic groups and members of each group were counted under a stereo microscope.

Table 1: Description of sites selected for the study in Ile-Ife, Osun State, Nigeria

No.	Nature of site	Location	Coordinate	Pollutant	Distance from the reference point
1	Fallowed plot	T&RF, OAU	7°33'8"N 4°33'25"E (290 m asl)	-	11.0 km
2	Frequent pesticide application	T&RF, OAU	7°29'0"N 4°32'12"E (256 m asl)	Pesticides	10.1 km
3	Frequent fertilizer application	T&RF, OAU	7°33'11"N 4°33'23"E (290 m asl)	Fertilizers	10.4 km
4	OAU central dumpsite	Tonkere Road	7°33'9"N 4°32'58"E (287 m asl)	Municipal waste	1.1 km
5	Auto-mechanic workshop	Ondo Road	7°29'1"N 4°32'12"E (253 m asl)	Spent oil	4.2 km
6	Scrap iron and steel smelting industry	Ibadan Road	7°29'47"N 4°28'33"E (256 m asl)	Metal deposit	6.0 km

The Faculty of Agriculture Building on the University campus was taken as reference point in describing distances separating selected sites. T&RF: Teaching and Research Farm; OAU: Obafemi Awolowo University; asl: elevation above sea level.

2. Physicochemical properties of collected soil samples

2.1 Soil texture

The texture of soil collected from each experimental site was determined at the Soil Testing Laboratory, Faculty of Agriculture, Obafemi Awolowo University using the hydrometer method. To 51 g sieved, air-dried soil sample was added 100 ml 5% sodium hexametaphosphate (Calgon) with 100 cm³ distilled water. The mixture was stirred with a rod and left to set for 30 min. The suspension was then stirred for 15 min using the Stuart flask shaker multimix machine after which it was transferred into a glass measuring cylinder and made up to the 1000 ml mark with distilled water. A plunger was used to agitate the content of the cylinder to ensure that all particles were in the suspension. The hydrometer was lowered slowly into the suspension until it floated and the first reading on the hydrometer was taken after 40 s, followed by the second reading after 3 h. The temperature of the suspension was also taken at each hydrometer reading. The first reading measured percentage of silt and clay in suspension while the second reading determined percentage of clay alone. Results were corrected to a temperature of 20°C; for every degree above 20°C, 0.36 was added to hydrometer reading before computation and for every degree below 20°C, 0.36 was subtracted. Hydrometer reading of a blank was also taken for comparison of results; the blank consisted of only 100 ml 5% Calgon made up to 1000 ml mark with distilled water.

Given: Hydrometer reading of suspension at 40 s = H_1
Hydrometer reading of blank at 40 s = B_1
Temperature at 40 s = T_1
Hydrometer reading of suspension at 3 h = H_2
Hydrometer reading of blank at 3 h = B_2
Temperature at 3 h = T_2
% Sand = $100 - 2[H_1 - B_1 + 0.36(T_1 - 20)]$
% Clay = $2(H_2 - B_2) + 0.36(T_2 - 20)$
% Silt = $100 - (\% \text{ sand} + \% \text{ clay})$

The textural class of each soil sample was determined by inputting obtained values (i.e. percentage sand, clay and silt) into Textural Triangle, a mobile application developed by the USDA.

2.2 Organic content

The organic carbon (OC) and organic matter (OM) contained in collected soil samples were determined following standard procedures. To 1.0 g air-dried soil sample was added 10 ml 0.5 M ammonium ferrous sulphate solution. Concentrated H_2SO_4 (20 ml) was added to the mixture and the flask was allowed to stand for 20-30 min. The resulting suspension was diluted with 200 ml distilled water; 10 ml 85% H_3PO_4 and 0.2 g NaF were added with 1 ml diphenylamine indicator to show the endpoint. The colour of the solution at the beginning was dark green due to Cr^{3+} , shifting to turbid blue as the titration proceeded and changed sharply to a bright green at the end-point.

$$\text{Organic carbon (\%)} = \frac{(\text{Blank} - \text{Titre}) \times 0.5}{0.5} \times 0.39; \text{Organic matter (\%)} = \text{OC} \times 1.72$$

2.3 Soil pH

The soil pH in $CaCl_2$ was determined following the method of Hendershot et al. (2007). Ten grams (10 g) of each soil sample was measured into a pH cup and 20 ml 0.01 M $CaCl_2$ was added. The suspension was stirred intermittently for 30 min and left to stand for about 1 h. A combination electrode was immersed into the clear supernatant and the pH was recorded once the reading was constant.

2.4 Heavy metal determination

For extraction of heavy metals, 5 g soil samples were measured into conical flasks after which 50 ml HCl was added. Mechanical shaker was used for 30 min and filter paper was used to extract heavy metals into plastic bottles. Concentrations of heavy metals in extracted samples were determined at the Agronomy Laboratory, University of Ibadan, Oyo State.

3. Statistical analysis

The monthly faunal population data were natural log-transformed before analysis of variance (ANOVA) was carried out using Statistical Analysis Software (SAS) v. 9.0 and mean values were separated using Tukey's Honestly Significant Difference (HSD) test at 0.05 level of probability. Data for organic content of soil samples were also subjected to ANOVA and mean values were separated using the $LSD_{0.05}$ test.

III. RESULTS AND DISCUSSION

A. Species composition and relative abundance of soil fauna

The sampling site ($P < 0.001$), soil depth ($P < 0.01$) and period of sampling ($P < 0.001$) had significant effect on population of soil fauna (Table 2). Population of soil-dwelling organisms is known to vary with land use (Silva et al., 2018; Nanganoa et al., 2019) and degree of soil pollution (Austruy et al., 2016; Kanwal and Rana, 2020). Generally, faunal abundance and species richness are higher in fallowed soils but decrease with increasing pollution (Xie et al., 2016; Dairo and Soyelu, 2017). This trend was reported in the present study with significantly lower soil fauna population at sites polluted with chemical fertilizers, municipal waste, spent oil and metal deposits (Table 3). A combination of toxicity, alteration of faunal behaviour by pollutants and interference with physiological processes has been offered as possible explanation for depletion of fauna in polluted soils (Odesola, 2020).

Soil depth is one of the natural factors that affect faunal distribution (Will et al., 2010; Eilers et al., 2012), and similar to previous reports (Baldrian et al., 2012; Ko et al., 2017), it had a significant inverse relationship with faunal population in the current study. Occupation of the first few centimeters of soil by a higher number of fauna appears to be an adaptive feature as it becomes increasingly difficult for them to dig deeper into the soil. This might also explain why the faunal distribution pattern remains unchanged despite contamination in some soils (Goberna et al., 2005). Reduction in faunal population with increasing depth has also been attributed to changes in edaphic factors such as pH, moisture contents, quality and quantity of organic matters, and oxygen concentrations throughout the soil depth profile (Ko et al., 2017).

There are two seasons in Nigeria but the duration of each varies between the southern and northern parts of the country. In southern Nigeria where this study was carried out, the rainy season starts in mid-March and extends to mid-October while the dry season covers late October to early March with peak dry conditions between early December and late February (CTN, 2011). A significantly lower faunal population was recorded during the dry season (Fig. 1) and the lowest recorded between January and February (27-28 individuals) coincided with the peak period of dry season for 2019. This peak period was characterized by high

temperature (27.25°C) and low relative humidity (70.33%) while July-August marked by a significant increase in faunal population had a lower temperature (26.86°C) and higher moisture level (90.48%). Adejuyigbe (1989) recorded low numbers of soil arthropods when there was low soil moisture content and high soil temperature while Badejo (1990), working on abundance of springtails, reported a positive correlation between soil moisture content and abundance of soil-dwelling Collembola on one hand with a negative correlation between soil temperature and number of Collembola on the other. However, Choi et al. (2006) identified soil moisture content as the most important factor determining distribution of soil organisms. In order to escape drought, soil animals either move deeper into the soil or disperse to moist patches (Xiang et al., 2008).

Table 2: Analysis of variance showing effect of location, soil depth and period of sampling on population of fauna in polluted soils

Source of variation	df	Sum of squares	Mean square	F value
Sampling site	5	4250.98	850.19***	11.38
Soil depth	2	706.93	353.46**	4.73
Time of sampling	11	5768.76	524.43***	7.02
Replication	2	4.32	2.16	0.01
Error	627	147120.43	234.64	
Total	647	157851.42		

** , ***: $P < 0.01$ and $P < 0.001$, respectively

Table 3: Average number of fauna extracted from soil samples collected from different sites and soil depths

Fallowed plot	Frequent pesticide application	Frequent fertilizer application	OAU dumpsite	Mechanic workshop	Smelting industry
175.00a	162.22a	85.56c	128.89b	80.56c	53.89d
Soil depth					
	0-5 cm		5-10 cm		10-15 cm
	133.89a		118.89b		90.28c

Soil fauna play vital roles in biological processes such as respiration, mineralization, litter decomposition, soil structure maintenance and community energetics (Ruan et al., 2005; Huhta, 2007; Briones, 2014) which are indices of soil health. As a result of these sensitive processes, soil fauna have been widely recommended as bioindicators (Bileva et al., 2014; Ertiban, 2019) and a significant change in their population or total absence in response to soil pollution usually signals caution. A positive correlation exists between faunal biomass and rate of soil processes (Ruan et al., 2005). Soil fauna belonging to eighteen (18) taxonomic groups were extracted and counted in the present study; while all the groups were present in fallowed soil samples, some taxonomic groups were not found at polluted sites (Table 4). Three taxonomic groups were absent in soil samples taken from the site with frequent fertilizer application while four groups were absent in soil samples from the mechanic workshop and smelting industry. Their absence was indicative of their intolerance to soil pollutants and this had adverse effect on biological processes that they mediate in the soil (Gillet and Ponge, 2003).

B. Physical and chemical properties of soil samples

The textural characterization, organic content and pH(CaCl₂) of experimental soil samples are presented in Table 5. The soil samples were mostly sand along with varying amounts of clay and silt. The proportion of sand, silt and clay determines the extent to which pollutants are mobile or available within the soil (van Deuren et al., 2002; Hanson et al., 2017). This in turn affects remediation efficiency (Falciglia and Vagliasindi, 2015; Koul and Taak, 2018). Most organic and inorganic pollutants tend to bind, either chemically or physically, to the fine (i.e., clay and silt) fraction of a soil, thereby, making them less amenable to remediation interventions. The removal kinetics of pollutants increases significantly with an increasing sandy fraction. However, too much sand in the soil will inhibit the soil's ability to hold nutrients and provide adequate moisture needed for healthy growth (Parikh and James, 2012; Stack, 2016).

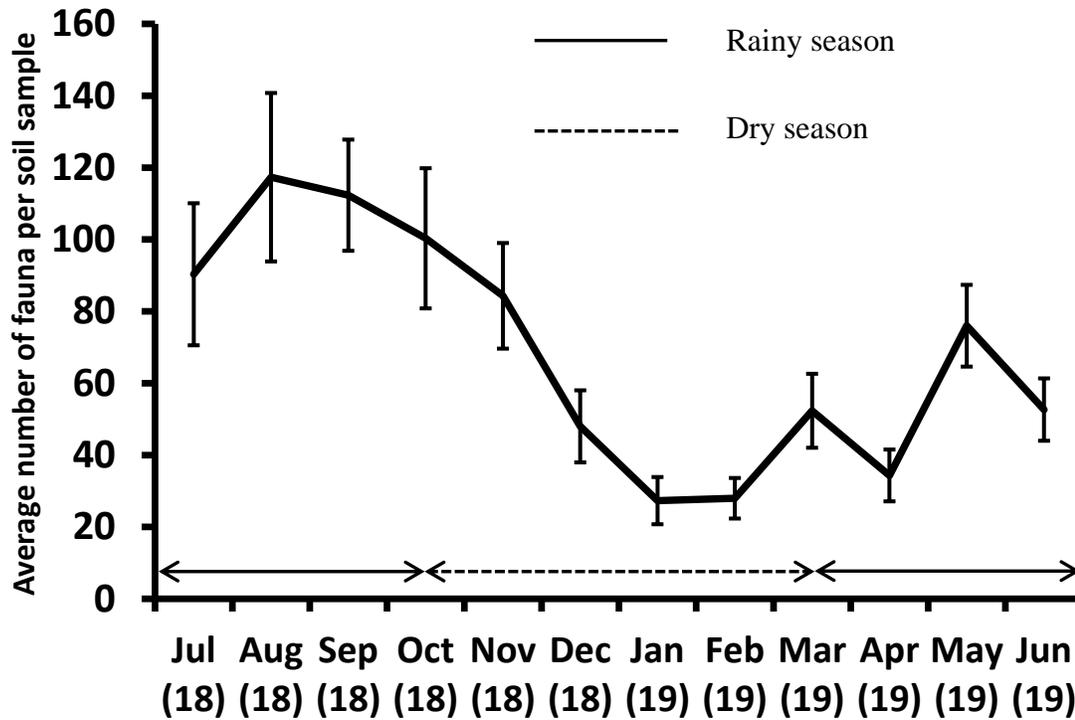


Figure 1: Relative abundance of soil fauna in experimental soil samples over a period of twelve months

Table 4: Different categories of soil fauna extracted from the six experimental sites

Taxonomic group	Fallowed plot	Frequent pesticide application	Frequent fertilizer application	OAU dumpsite	Mechanic workshop	Smelting industry
Acari	+	+	+	+	+	+
Araneae	+	+	-	+	-	+
Chilopoda	+	+	+	+	+	+
Coleoptera	+	+	+	+	+	+
Collembola	+	+	+	+	+	+
Diplopoda	+	+	+	+	-	+
Diplura	+	+	+	+	+	+
Diptera	+	+	+	+	+	+
Hemiptera	+	+	+	+	+	+
Hymenoptera	+	+	+	+	+	+
Isopoda	+	+	+	+	+	-
Isoptera	+	+	+	+	+	+
Lepidoptera	+	+	+	-	-	+
Lumbricidae	+	+	+	+	+	-
Opiliones	+	+	+	+	+	+
Orthoptera	+	-	-	+	+	+
Protura	+	+	+	+	+	-
Pseudoscorpiones	+	+	-	+	-	-

+, - : present and absent, respectively

Table 5: The textural properties, organic content and pH of examined soil samples

Nature of site	Textural characterization				Organic content		pH(CaCl ₂)
	Sand (%)	Silt (%)	Clay (%)	Class	OC (%)	OM (%)	
Fallowed plot	59	17	24	Sandy clay loam	3.354	5.769	5.44
Frequent pesticide application	79	9	12	Sandy loam	0.897	1.545	3.80
Frequent fertilizer application	81	7	12	Sandy loam	0.741	1.275	3.92
OAU dumpsite	69	17	14	Sandy loam	0.663	1.140	7.60
Mechanic workshop	59	17	24	Sandy clay loam	3.159	5.433	5.90
Smelting industry	89	1	10	Loamy sand	0.312	0.537	7.78
				LSD _{0.05}	0.127	0.284	

OC: Organic carbon; OM: Organic matter

The organic matter (OM) and organic carbon (OC) are components of the soil organic content that was quantified in this study. Both components were significantly lower in polluted sites and the depletion was most severe at the smelting industry with predominant metal deposit. The soil OM serves as food for the inhabiting fauna, thus, encouraging biodiversity and build-up of faunal biomass (van Noordwijk et al., 1993) as evident in this study. The OM also improves overall health of the soil by enhancing soil structure, moisture holding capacity, nutrient availability and activity of soil organisms (Bot and Benites, 2005; Huhta, 2007; Frouz, 2018). A healthy soil contains a large number and variety of organisms which interact to provide a wide variety of ecosystem services that favour agriculture (Griffiths et al., 2019). The soil OC also plays an important role in the C cycle which is crucial for supporting ecosystem services (Schmidt et al., 2011).

The soil pH varied widely (3.8-7.8) among experimental sites, being < 4 in soil samples from sites with frequent pesticide and fertilizer applications. Fertilizers are major sources of hydrogen ions in the soil and pH values as low as 1.5 can be found in a zone immediately around a fertilizer band (Harter, 2007). Both extremely acidic (3.5-4.4) and extremely alkaline (> 9.5) conditions are generally detrimental to animal life; an indication that a critical review of types and frequency of application of fertilizers and pesticides at the Teaching and Research Farm is necessary. Nevertheless, tolerance of soil fauna to acid pH is highly variable, even among closely related species. Generally, microarthropods and Enchytraeidae have maximum abundances in acid soils (pH < 5) whereas nematodes and litter-dwelling earthworms prefer slightly acid pH (5-6). On the other hand, soil-dwelling earthworm species prefer pH of 6-7 (Lavelle et al., 1995).

Modern farming, industrialization, and increased vehicular use have led to high concentrations of heavy metals such as Pb, Ni, Cr, Cd, Al, Hg, and Zn (Atafar et al., 2010) and they are usually toxic in the environment when present beyond permissible levels. Although heavy metal residues were present in all the sites (either naturally or as a result of human activities) (Table 6), they were considered safe to soil fauna because the levels were within permissible range.

Table 6: Heavy metal residues in soil samples collected from different experimental sites

Nature of site	Iron	Copper	Zinc	Chromium	Cadmium	Lead	Nickel
	mg/l						
Fallowed plot	1.31	0.41	7.01	0.00	0.00	0.15	0.12
Frequent pesticide application	15.32	1.10	14.41	0.00	0.02	1.04	0.25
Frequent fertilizer application	2.44	0.25	0.61	0.00	0.00	0.28	0.15
OAU dumpsite	9.11	1.81	10.81	0.00	0.21	1.89	0.21
Mechanic workshop	21.26	0.96	16.90	0.00	0.04	0.80	0.31
Smelting industry	99.10	13.00	137.51	0.29	0.19	10.40	1.55
*Maximum permissible level	50,000.00	100.00	300.00	100.00	3.00	100.00	50.00

* Source: Chiroma et al. (2014).

IV. CONCLUSION

The obtained results showed that pollution affected physicochemical properties of soil adversely and threatened survival of soil fauna. It is, therefore, very crucial that closer attention is given to environmental impact assessment of human activities in order to ensure wholesome soil and conservation of soil-dwelling organisms. In addition, nations with poor records of pollution control should adopt some of the effective measures implemented by successful ones. For instance, the Integrated Pest Management policies which have been mandated in the European Union and other similar practices being promoted in many parts of the world could be embraced. The *Intergovernmental Technical Panel on Soil* through the FAO's *Global Soil Partnership* has also developed some guidelines (Hammond, 2017) which could be adopted for sustainable soil management.

ACKNOWLEDGMENT

The authors appreciate Dr. A.I. Ajao of the Atmospheric Physics Research Group, Department of Physics, Obafemi Awolowo University for providing the meteorological data used in this study.

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Influence of Logistics Management Practices on the Logistic Performance of Humanitarian Organizations in Kakamega County, Kenya

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DOI: 10.29322/IJSRP.10.09.2020.p10513

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10513>

Abstract- The study examined the influence of logistic management practices on Logistics performance of humanitarian organizations in Kakamega County. The specific objectives of the study were to establish the influence of inventory management practices, Transport management practices, information flow practices and Warehouse Management practices on performance of Humanitarian organizations in Kakamega County, Kenya. The study used both descriptive and explanatory research designs. The target population for the study was the humanitarian organizations in Kakamega North Sub County. The study population composed of 64 the members of recognized NGOs in the county and the humanitarian officers working for international NGS in Kakamega North Sub-county. A semi- structured questionnaire was administered through drop and pick technique. The questionnaire was tested for validity and reliability. Both quantitative and qualitative techniques were used to analyse the data with the assistance of SPSS software. The study found that humanitarian organisations, engaged transport management practices that allow for timely deliveries of goods and services to consumers, employ logistic management practices, which help the organization to avoid inventory disruption in the production cycle. The research also found that warehouse management methods promote the delivery of goods to the customers in the appropriate quantity. Based on the regression analysis the study established positive beta coefficients with all study variables, inventory management practices, transportation practices, information flow practices and warehousing practices. In that vein the study concludes that any change made is expected to positively impact logistical effectiveness and efficiencies.

I. BACKGROUND TO THE STUDY

Logistics is part of the supply chain process that plans, implements, and controls the efficient, effective forward and reverses flow and storage of goods, services, and related information between the point of origin and the point of consumption in order to meet customers' requirements. Humanitarian logistics refer basically to the concept of procuring, mobilizing, storing and even distribution among other aspects that are aimed at delivering material assistance to the people that have been hit by disaster (van der Vorst, 2004). It refers therefore to the set of a system which helps to deliver humanitarian assistance effectively and promptly based on the optimal use of resources.

The basic aim of logistics in humanitarian assistance is to create an art of strategy with which material assistance can be delivered to those that have been hit by disasters. It is important to highlight two important concerns in this regard as provided by the Pan Africa Health Organization (2001). One, that it is difficult to improvise the logistic structures during an emergency, and thus, there is need to ensure well planned and prepared framework for such kind of emergencies long before they occur. Either, there is need to use the resources at hand in an appropriate manner which can optimize the benefits that the beneficiaries get. Two, that the different stages that designate the flow of material supplies basically from the source to the beneficiaries constitutes of very closely interrelated linkages (Pan Africa Health Organization, 2001).

The logistics management practices include needs assessment practices (Selda Emmett, 2010), material and service ordering practices (Mungatia, 2010), optimal donations management practices (Cozzolino, 2012), best warehousing practices (Americas Relief Team, 2012), documentation, cataloging, consolidation and recording practices (Oloruntoba, 2006), and, transportation and delivery practices (Moeiny & Mokhlesi, 2011). Adebayo (2012) described logistics management practices as an organization's collection of activities to promote efficient logistics management. Logistics managers are responsible for designing and implementing plans that can contribute to sustainable competitive advantage if implemented. In order to satisfy customers or company's needs, logistics refers to the resource flows between the source and the selling point (Vikapia, 2005). Logistics resources can include physical things such as food, material, animals, equipment and liquids, and abstract objects, such as time and

knowledge. Logistics management is a supply chain management component that schedules, executes and tracks the movement of products, services and related information between point and place of use, effectively forward and reverses the distribution and storage of the goods and services, so that they can meet our client's requirements. Management of the logistics industry plays a significant role in the performance of any company and has a direct impact on its outcome.

More significantly, organizational processes are more critical than low cost of goods in order to achieve customer satisfaction. Logistics experts should consider themselves to be a company client and aim to add value for their customers every day. Logistics management activities include operations handling the movement of product from the receiving dock of the store to the point of sale through the warehouse. Logistics involves storage, purchasing, organization and storage within the store of goods (Samli 2005). It includes both consumer returns and seasonal returns to the Distribution Center (DC). The results are included.

International humanitarian organizations are key source of humanitarian assistance in Kenya (Omondi, Ombui & Mungatu, 2013). Currently, there is approximately 30 international NGOs, operating and providing humanitarian aid in Kenya (Mungiti, 2013). The main role of international NGOs in Kenya is to mobilize resources for humanitarian assistance to the community. They also act as a watch to the inhuman acts as well the shortcomings by the governments in its service delivery to the people. The growing demand for humanitarian aid in Kenya has called for more support from the international community, much of which is supported by humanitarian organizations. More importantly, these organizations have played a key role in checking on the checks and balances on the state of governance by the government to its citizens (Omondi, Ombui & Mungatu, 2013). In their process of giving assistance however, these organizations have been faced with various challenges (Mungiti, 2013). According to Omondi, Ombui and Mungatu (2013) these include; insecurity in conflicts and harsh zones, low funding from their mother organizations and other donors, poor strategic planning, conflicting interests between them and that of the Kenya government, hostility from the from the community especially in the North Eastern Part of Kenya, poor governance, harsh climatic conditions which derail their operations at times, corruption, political upheavals, limited capacity and, religious and cultural conflicts from the areas they are required to deliver humanitarian assistance.

The Global Humanitarian Assistance (2013) has classified Kenya as a fragile nation in terms of humanitarian aid. The country's demand for humanitarian aid has been on a sharp rise, which has been attributed to the increasing state of disasters such as droughts, foreign refugees, floods, terrorist attacks, accidents, and disease outbreaks among other disasters. International humanitarian organizations have been very proactive in providing aid to the people affected by disasters (Ergun, et al., 2009). Both logistic and supply chain practices and the management issues that arise from them have become central in these organizations, from the realization of the role they play in the overall performance of the organizations (Tysseland, 2009). The overall problem in disaster relief is poor support for logistics. Logistics plays key role in supporting organizations as they strive for more efficient management systems (Cozzolino, 2012) as in the business practices, the inefficient logistics system together with the inefficient internal management would disable the organization to respond to the needs of customers with the lowest price at the shortest feasible time frame including the quality level which does not meet customer expectation and would lead the organizations to the competitive disadvantage situation against their rivals.

In Kenya, (Gitonga, 2017) carried out a study on the link between logistics management practices and operational performance of fast moving consumer goods manufacturers in Nairobi. The study established that Fast moving manufacturing companies Kenya employed logistics management practices including transportation management practices which enabled timely delivery of products and services to customers, inventory management practices which enable the firm to avoid inventory bottleneck in production. In addition, the study found that warehouse management practices facilitated products delivery at the right quantity to the customers and packaging practices. (Mwangangi, 2016) studied the influence of logistics management practices on the performance of manufacturing firms in Kenya. The study concluded that logistics management was collectively significant in influencing the performance of the manufacturing firms.

Thus, the purpose of this research was to investigate the influence of logistics management practices of performance of humanitarian organizations in Kakamega North sub county, Kakamega County, Kenya. The specific objectives for the study were; to establish the influence of inventory management practices on performance of Humanitarian organizations, to assess the influence of Transport management practices on performance of Humanitarian organizations, to determine the effect on information flow practices on performance of Humanitarian organizations and to establish the influence of Warehouse Management practices on performance of Humanitarian organizations in in Kakamega North Sub-County, Kakamega County, Kenya

II. THEORETICAL FRAMEWORK

1. Resource Based View

Resource-based view has been developed in work by Barney (1986), for analyzing firm behavior and competitive strategy (Mowery, Oxley & Silverman, 1998). The RBV contends that the idiosyncratic resources and capabilities of firms are the key sources of sustained competitive advantage. This premise appears to be supported by logistics and Supply Chain Management research (Lynch et al., 2000). According to Barney (1991) resources can be classified into organizational capital resources, physical capital resources and human capital resources. Capabilities can be defined as the skills a firm needs to take full advantage of its assets. Capabilities are complex bundles of individual skills, assets and accumulated knowledge exercised through organizational processes that enable firms to co-ordinate activities and make use of their resources (Olavarrieta & Ellinger, 1997).

An organization may choose to focus on implementing logistics management practices to expose the negative environmental performance of its competitors. In this way, the organization can cut a niche for its products. Developing and implementing logistics management practices can only be achieved through creating environmentally responsible policies and investing in the necessary equipment and training. Creating a competitive advantage through implementing reverse logistics practices would lead to improved market share and consequently higher profit margins (Fortes, 2009).

2. Relief Coordination Theory

This theory posits that it is possible to orchestrate the efforts of diverse organizations and the orderly and organized direction of activities (Seybolt, 1997; McEntire, 1997). The Humanitarianism and War Project offers a more specific and often cited definition of the concept as: managing information; mobilizing resources and assuring accountability; orchestrating a functional division of labour in the field; negotiating and maintaining a serviceable framework with host political authorities; and providing leadership (Minear, 2002).

Analysts and scholars also often suggest that coordination is important to improve service delivery effectiveness. Indeed, while effectiveness is rarely defined, it is most often given as the reason why achieving coordination among service providing agencies is important (Minear, 2002). An effort to reduce duplication, often framed as securing or improving organizational efficiency, is also frequently offered as a rationale for why humanitarian organizations should seek to coordinate their assistance operations (McEntire, 1997).

3. Social Network Theory

Social Network Theory which is also called the Network theory, network analysis (Scott, 2001) has nodes and links as independent construct and node size, density, link strength as dependent constructs. Its proponents include Stanley Milgram (small worlds problem, six degrees of separation), Mark Granovetter (the strength of weak ties) and Barnes who was the first to study social networks. It is a theory social network theory that focuses on the many ways that people interrelate and communicate via the various social networking platforms (Scott, 2000).

According to Haythornthwaite (1996), social network theory understands social relationships in terms of nodes and ties. Nodes are the individual actors within the networks, and ties are the relationships between the actors. There can be many kinds of ties between the nodes. The fact that these kinds of ties can vary in intensity and importance is just one of the many variables that can factor into social network theory. Often the analysis of a network will involve dots of varying sizes and colours connected by lines of differing lengths and thicknesses. A social network analyst will try changing variables and looking at the connections in various ways to discover hidden correlations and trends in the network.

Layton (2006) argues that basically there are two elements in any social network, online or offline; nodes and ties. Nodes are the elements of the network that act - whether they are organizations, small groups, or individuals - and ties are the ways these nodes relate to each other. This could be as minor as an email correspondence or as intimate as a marriage. In its most simple form, a social network is a map of all of the relevant ties between the nodes being studied. The network can also be used to determine the social capital of individual actors. These concepts are often displayed in a social network diagram, where nodes are the points and ties are the lines.

The power of social network theory stems from its difference from traditional sociological studies, which assume that it is the attributes of individual actors whether they are friendly or unfriendly, smart or dumb among others that matter. One of the defining elements of social network theory that differentiates it from other sociological sciences is the weight it gives to the relationships between the nodes, as opposed to the attributes of the nodes themselves. Social networks have also been used to examine how Humanitarian Organizations interact with each other, characterizing the many informal connections that link executives together as well as associations and connections between individual employees at different Humanitarian Organizations (Layton, 2006).

These networks provide ways for Humanitarian Organizations to gather information, deter competition, and even coordinate in setting operational policies (Layton, 2006)..

Conceptual frame work

It is a plan showing the relationship between Logistics Management practices and disaster response among international humanitarian organizations in Kenya. Rapid disaster response and management (dependent variable) in international humanitarian supply chain is as a result of a set of two independent variable; logistics management practices. However, the success of each of these two independent variables is as a result of a subset some practices, which relate to each of them. Below is a conceptual representation of the variables:

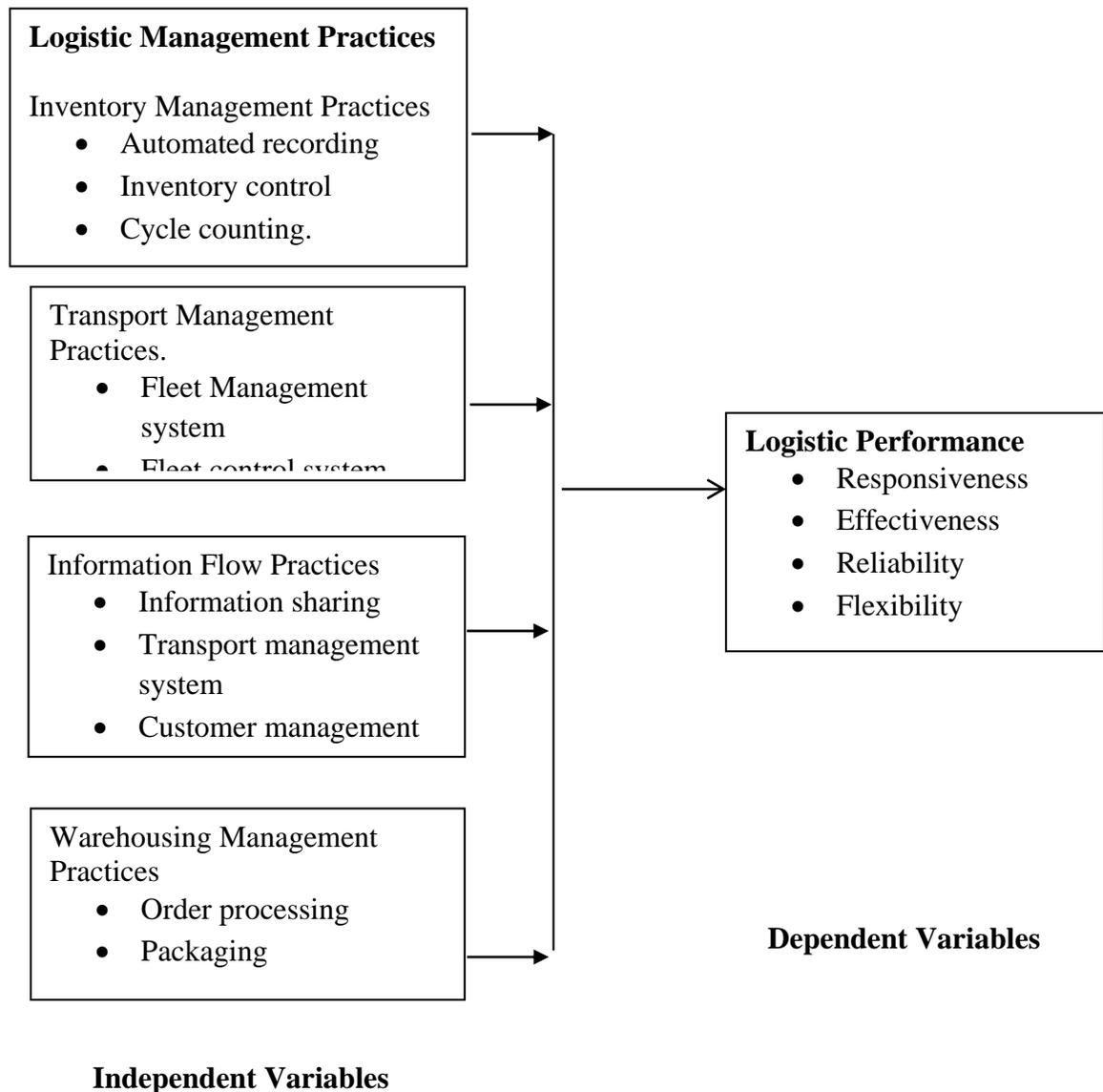


Figure 1: Conceptual Model

III. REVIEW OF VARIABLES

2.3.1 Inventory Management Practices

Inventory Management is defined in Stevenson (2010) as a framework used by firms to monitor their inventory objectives. It requires the registration and tracking of stock rates, prediction of potential demands and arrangement of when and how. Deveshwar and Dhawal (2013) on the other hand proposed that inventory management as a method used by companies to organize, store and substitute inventory so as to minimize the cost of ensuring that goods are properly supplied simultaneously.

Inventory management practices provide visibility in the supply chain system and the upstream and downstream inventory. The purpose of the inventory is to provide the appropriate levels of service for internal and external customers, determine current and potential requirements for all forms of inventory, reduce costs and pay for the inventory (Lysons & Farrington, 2012). All stock policies in the business must be profitable by operating expenditures and working capital needs over the driving period. According to Lysons and Farrington (2012), the calculation of inventory's effective and productive efficiency depends on the degree to which the firm has the correct inventory quantity in the right place and at the right time. The measuring indicators for this inventory include lead time, service time (Security inventory), stock turnover rate, inventory results over a certain period and inventory cover.

Naliaka and Namusonge (2015) conducted a study in Kenya that inventory management affects production companies' competitive advantages. The same study shows further that the company can compete on a long-term basis on the basis of the quality and delivery. Competitive value includes capabilities which make it possible and a crucial management decision to distinguish an organisation (Li, Ragu-Nathan, Ragu-Nathan, & Subba Rao, 2006). (Subba Rao, 2006).

One of the key success factors of any institution, including humanitarian organisations, is efficient and efficient inventory management flow across the value chain. The problem in inventory management is to balance the interaction between inventory supplies and demand. To order to meet the expectations of those without loss due to product inventory losses, preferably a company needs to have enough stock. On the other hand, due to the expense of carrying inventories, the company doesn't want to have too much inventory available. Inventory decisions are high risk and have an significant effect on the management of the supply chain of an enterprise. Inventory management practices, according to Dimitrios (2008), are recognized as a critical area of concern that requires the highest priority.

2.3.2 Transportation Practices

Transport practices are the most efficient and realistic method of meeting transport targets, including low cost, timely delivery of transportation-related information to the remaining business and to consumers, improved efficiency and optimal utilization of company resources. Transport practices are the most effective and practical approach. As stated in Liviu & Emil, (n.d.), Younkin, 2006, has advanced best practices in transport management: carriers' practices and load planning and optimization practices, shipment preparation and execution practices, freight payment and audit practices, and performance monitoring.

The primary goal of transport is to move the consignments from A to B. Transport is a crucial strategic link between supply chain companies, and must be efficiently managed for fair prices in meeting customer due dates and other shipping requirements (Wisner et al. 2011). Transportation between manufacturing plants, warehouses, distribution centers, terminals and consumers provide the movement of goods, products and persons in logistics. Transportation is the only operation that delivers services via the logistics outbound and inbound. An inefficient transportation system may cause the company to incur high costs to deliver the product to the consumer, and this will result in a loss to the company; and the transportation system must be able to resolve the major issues of mode selection, route selection and fleet size because it is the critical force for the company's competitiveness (Goldsby et. al., 2014).

Transport is an important business activity that both internally and interorganizationally plays a connective role. Internally, transport links different activities leading to resourced goods being converted according to consumers' preferences and expectations (Tseng et al., 2005). Transporting is required in the whole logistics chain since it facilitates the entire process of materials and products moving into, through, out of and back to a firm consisting of four main activities: inbound logistics, covering the movement of material received from suppliers, materials management describing the movement of materials and components within a firm, physical distribution referring to the movement of goods outward from the end of the assembly line to the customer and returns back from customers. Transportation is one of the six key logistics activities that drive total logistics costs along with customer service (including parts, service support and returns goods handling), inventory management (including packaging and reverse logistics), warehousing and storage, materials handling and procurement and order processing (including information management and demand forecasting) (Lambert et al. 1998).

Externally, transport plays an intermediary role in the supply chain which facilitates the physical flow of goods into or out of where they are manufactured. It therefore covers organizational boundaries linking the entire supply chain's channels and encompassing input and output sides of suppliers (Lai et al., 2004).

2.3.3 Information Flow Practices

With the development of ICT, the flow of information offers a special benefit to connect one activity to the others and make available in the company as well as with external providers, channels and customers in real time data created by business. For the efficient and successful flow of information, the logistics processes of the organization need to be strengthened through planning, tracking, collaboration and tracking logistics processes. The successful operation of the logistics information technology system involves the use of hardware and technology transfer, according to Nowakowska and Grunt (2007), and the information system should be configured to best support a logistics system to improve the contact line (Wisner et al. 2007).

Long and Wood (2005) indicated that knowledge management during a crisis is the single biggest success factor. IT helps integrate activities and provide proof of information to improve the functioning of the supply chain. The monitoring and management of relief operations includes complex decision support structures, communications and information structures. These programs enable the planning, response and management of crisis, disasters and emergency situations. Thomas and Kopczak (2005) argued that humanitarian supply chain practitioners need to find ways in which donors and the public can connect about how the effectiveness of the supply chain improves.

Maspero & Ittmann, 2008, asserted that it was an opportunity for the humanitarian supply chain to increase its contribution to and for disaster relief by introducing information management, technology, measuring and positioning initiatives. While delivery of disaster relief items is an important role in the supply chain for humanitarian aid, it should be strategic to provide timely information and analyze information for improved information on how operations can be improved.

2.3.4 Warehousing Practices

Warehousing includes space determination, stock layout, configuration, and stock placement (Ballou, 2003). In logistics, it depends on warehousing picking and delivery accurately to deliver the right amount of product. Warehousing ensures that supplies are delivered in the right place and on time to the right customer. The production of a commodity at the right price and in good order and quality guarantees cost-effective operation too. Pienaar and Voght (2006) have suggested the effective service of customers depends on the operations of the warehouse. Warehouse has three business functions: the function receiving and passing on customer orders; the IT function ensuring that technology for the efficiency of storage is used and the storage function which temporarily or constantly stores the product.

In a supply chain, the warehouse function of the material flows between the supplier and the customer is very critical because it serves as a node. Companies are increasingly pushed to develop their warehouse operations in today's dynamic business climate. Several businesses have also adjusted their value proposal to increase their customer service rates, leading to improvements in warehouse position (Grant, 2006).

In order to coordinate operations in the stores correctly, a well implemented storage management system. It is important to ensure that our company performs efficiently and profits from economies of scale and an enhanced customer experience. Well-developed storage systems are designed to assist in the definition, operation and control of inventory procedures (Forger 2004). In the past, warehouses were often labeled cost centers and never added value. A radical change in warehouse operations was observed by the migration of production to the Far East, growth in e-commerce and the market requirements (Richards, 2014). (Frazelle, 2002) states that warehouses are important for a supply chain because they provide storage for raw materials, components, work-in-process, and finished goods; operate as distribution and order fulfillment centers; and perform localized and value-added warehousing.

(Crisan, 2009) states that Companies could gain cost advantage using their logistics area of the business because warehouse management is a possible source of cost improvements from logistics that companies could use during this economic crisis. Best practices for warehouse performance measurement that lead to improved performance and their solution lead to the optimal use of storage space, activity for customer relations, quality level, use of assets and costs. Performance assessment makes the biggest contribution to figuring out the causes of poor production. Solutions to improve performance and improve performance, to prevent discomfort before it is too late, to monitor customer relationships, to monitor processes and costs and to maintain quality have to be found after that step (Ackerman, 2003).

A number of studies have been done in the area of logistic management practices and their influence on performance. Globally, Green, Whitten, and Inman (2008), established a positive relationship between logistics performance and organizational performance within the manufacturing sector. An interesting observation by Solakivi, Töyli, Engblom and Ojala, (2011); Logistics was being handled equally efficiently in the surveyed companies regardless of whether it had remained in-house or been outsourced. This finding suggests that the fit between the company context and its outsourcing decision might be more important an operational performance driver than outsourcing per se.

In Kenya, (Gitonga, 2017) carried out a study on the link between logistics management practices and operational performance of fast moving consumer goods manufacturers in Nairobi. The study established that Fast moving manufacturing companies Kenya employed logistics management practices including transportation management practices which enabled timely delivery of products and services to customers, inventory management practices which enable the firm to avoid inventory bottleneck in production. In addition, the study found that warehouse management practices facilitated products delivery at the right quantity to the customers and packaging practices. (Mwangangi, 2016) studied the influence of logistics management practices on the performance of manufacturing firms in

Kenya. The study concluded that logistics management was collectively significant in influencing the performance of the manufacturing firms.

Thus, the purpose of this research is to investigate the influence of logistics management practices of performance of humanitarian organizations in Kakamega North sub county, Kakamega County, Kenya.

A number of studies have been done both globally and locally in the area of logistic management practices and their influence on performance. However, very few studies have come out to establish the any relationship between logistic management practices and performance particularly in the humanitarian organizations in Kenya. This study therefore seeks to address this knowledge gap by establishing whether logistics management practices affects performance by conducting a study of the effect of logistics management practices on the performance of humanitarian organizations.

IV. METHODOLOGY

The research design for this study was descriptive survey research design. Descriptive survey design is recommended for studying large and small populations by selecting and studying samples from the target population. The population of this study consisted of all humanitarian organizations in Kakamega County operating within Kakamega North Sub-county. The target population included Red Cross, Afya Plus/ Ampath, Caritas International, Care International and St. John’s Ambulance all identified from the inter-related humanitarian actors with similar mandates. The 5 humanitarian organizations constitute 30 percent of the population of 17 Humanitarian organizations in Kakamega for representativeness. The researcher randomly selected a large sample that gives a study external validity. Questionnaires and interviews were used to collect data for the study. Once the data was coded the researcher conducted preliminary analysis to test for reliability using Cronbach’s alpha. Cronbach’s alpha is known as a good measure of reliability (Monette, *at el.*, 2002). Its values ranges from 0 to 1 with Cronbach’s alpha values between 0.8 and 1.00 indicating a considerable reliability, values between 0.70 and 0.80 indicate an acceptable reliability while values below 0.70 are considered less reliable and unacceptable. The results from reliability analysis aided to suggest whether questionnaire should be reformulated or not.

V. PRESENTATION AND DISCUSSION OF FINDINGS

Logistic Management Practices

A descriptive study of variable in the model is provided in this section. The section consists of three sections; concise study of independent variables and dependent variable. Logistics management is the main independent variable in this study. The management of logistics includes various constructs: inventory management, transport, information flow management and warehouse management. These are listed below.

Inventory Management Practices

The results of the study on the extent to which Inventory Management is practiced by humanitarian organizations in Kakamega North sub county are as shown in Table 1.

Table 1: Inventory Management Practices

Inventory Management Practices	Mean	Std. Deviation
The firm uses Enterprise Resource Planning system(Barcode) to track its inventory	4.60	0.70
The inventory management practices enable the firm to avoid inventory bottleneck in production	4.40	0.97
The firm provide external customer with the required inventory level with its inventory management practices	4.30	0.48
The inventory management practices keep cost at a minimum cost	4.30	0.67
The firm uses the right inventory management technique (JIT, Kaizen, ABC analysis etc.) to manage it inventory.	4.20	0.92

Overall **4.36** **0.75**

The study sought to determine the level at which the above inventory management services were exercised in the firm. The study established that inventory management in the humanitarian organizations in Kakamega North sub county is done to a large extent as evidenced by the overall mean of ($M=4.36, SD= 0.75$). The most rated statement was that the firm uses enterprise resource planning system (Barcode) to track its inventory with a mean of ($M= 4.60, SD=0.70$), followed by the statement the inventory management practices enable the firm to avoid inventory bottleneck in production a mean of ($M= 4.40, SD= 0.97$) indicating that it was practiced to a large extent.

The firm provide external customers with the required inventory level with its inventory management practices and the inventory management practices keep cost at a minimum cost were practiced to a large extent with the mean of ($M=4.30, SD= 0.48$) and ($M=4.30, SD= 0.67$) respectfully. The least rated statement was that the firm uses the right inventory management technique (JIT, Kaizen, ABC analysis etc.) to manage it inventory with a mean of ($M=4.20, SD= 0.97$). The respondents had varying opinions as evidenced in by the registered standard deviations. The statement the firm uses the right inventory management technique (JIT, Kaizen, ABC analysis etc.) to manage it inventory had the largest standard deviation (0.97) while the statement the firm provides external customer with the required inventory level with its inventory management practices registered the lowest standard deviation of (0.92).The findings above concur with the study findings of Lysons and Farrington (2012) who found out that the main aim of the firm inventory management is to keep costs at minimum.

Transport management

The study aimed to establish the patterns of transport management adopted by Kenya humanitarian organisations. A number of questions were addressed to the respondents who gave their answers on the Likert scale of 1 to 5, where 1 represented "not at all" and 5 represented "very large." The results are shown below;

Table 2: Transport Management Practices

Transportation Practices	Mean	Std Deviation
The transportation management practices enables timely delivery of products and services to customers	4.20	0.63
Through transportation management products are made available to the customer desire location	4.20	0.79
Products and services are delivered using the right mode of transportation	4.20	0.79
The organization spend at a minimum cost to transport product to customer	4.10	0.88
The organization uses electronic system to track all product that are transported to customer	4.00	0.94
Overall	41.4	0.81

From the table above the study established that transportation management is practiced by the firms to a large extent as evidenced by an overall mean of ($M=4.14, SD= 0.81$). The statements the transportation management practices enable timely delivery

of products and services to customers was practiced to a large extent with the mean of the ($M=4.20, SD=0.63$). The statements through transportation management products are made available to the customer desire location and the firm spend at a minimum cost to transport product to customer registered a mean of ($M= 4.20SD= 0.79$), indicating it was also done at a large extent in each case. The firms using electronic system to track all products that are transported to customer was practiced to a large extent with a mean of ($M= 4.10, SD= 0.88$), and the firm products and services are delivered using the right mode of transportation was practiced to a large extent with a mean of ($M=4.00, SD=0.94$).

The respondents differed the least on the statement that the firm products are delivered using the right mode of transportation as shown by the least standard deviation of (0.63) while they differed more on the statement that the firms use electronic system to track all product that are transported to customer with a standard deviation of (0.94). The practice of transportation by humanitarian organizations in Kakamega North sub county to a large extent concur with the arguments of Wisner *et al* (2011) that transportation is a vital link between firms in a supply chain and that it must be managed effectively to meet customer due dates.

Information Flow Practices

The study further sought to know the extent to which information flow is practiced by the humanitarian organizations in Kakamega North sub county. The findings of the study are as shown in Table 3.

Table 3: Information Flow Practices

Information Flow Practices	Mean	Std. Deviation
Information flow through ICT practice is used to plan logistical processes.	4.40	0.70
Logistics management process is monitored using information flow through ICT	4.30	0.90
The firm information flow through ICT is used to control the logistics process	4.30	0.90
The information flow through ICT is used to coordinate	4.20	0.80
The firm information flow through ICT is used to communicate	4.10	0.70
Overall	4.26	0.80

The study found that information flow was practiced in the humanitarian organizations in Kakamega North sub county to a large extent as evidenced by the overall mean of ($M= 4.26, SD= 0.80$). Majority of the respondents agreed to a large extent that the information flow through ICT is used to communicate as shown by a mean of ($M=4.40, SD=0.70$). The information flow through ICT is used to coordinate the logistics process, and logistics management process is monitored using information flow through ICT was practiced to a large extent as shown by a mean of 4.30 in each case, followed by the information flow through ICT practice is used to plan logistics processes as shown by a mean of ($M=4.20, SD=0.80$), and that the firm information flow through ICT is used to control the logistics process as shown by a mean of ($M=4.10, SD=0.70$).

The finding of the study is in line with the findings of Azevedo *et al* (2007) that for information flow to be effective and efficient; it must enhance the firm's logistics processes by planning, controlling, coordinating and monitoring the logistics process.

Warehousing Practices

The findings of the study on the extent to which warehousing is practiced by the humanitarian organizations in Kakamega North sub county in Kenya are as shown in Table 4.

Table 4: Warehousing Practices

Warehousing Practices	Mean	Std. Deviation
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Products are delivered in the right quantity to the customer	4.70	0.48
The firm label and load the right product to the right vehicle	4.50	0.53
Products leaves the warehouse clean and damage free for customer	4.50	0.53
The firm warehouse is close to the proximity of the customer	4.40	0.52
The firm stores it products using its facility	4.40	0.52
Overall	4.50	0.52

The study established that warehousing practices is employed by the humanitarian organizations in Kakamega North sub county to a large extent as evidenced by the overall mean of (M= 4.50, SD= 0.52). The most rated statement was the firm warehouse is close to the proximity of the customer with a mean of (M= 4.70, SD= 0.48). The products are delivered in the right quantity to the customer, the firm label and load the right product to the right vehicle are practiced to a large extent with a mean of (M= 4.50, SD= 0.53) in each case, followed by the products leaves the warehouse clean and damage free for customer and the firm stores it products using its facility were also practiced to a large extent with the mean of (M=4.40, SD= 0.52) in each case.

The findings concur with Richard (2011) that warehousing ensures the cost efficient operations by delivering the right product to the right customer at the right price, and in the perfect order and condition.

Relationship of Logistics Management practices to the Logistics performance

The study sought to link logistics management practices to logistics performance. The values of the variables to be collected were estimated by factor analysis and stored as dummy variables. The researcher then carried out a regression analysis to explain this relationship using SPSS version 21. The obtained findings are described below and discussed;

Table 5: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.919	0.844	0.796	.223

The research aimed at defining the effect of logistics management activities on logistical efficiency in Kakamega North Sub County of humanitarian organisations. Research findings suggest a clear relationship (R²= 0.844) exists between logistics management activities and humanitarian organizations' logistics efficiency. The result of the study also indicates that the value of adjusted R-squared is 0.796. This implies that 79.6% of the variance in humanitarian organizations' performance can be accounted for by logistics management practices. The remaining 20.4% can be explained by other variables which were not included in the model and the chance of variations.

Table 6: Analysis of Variance (ANOVA)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	119.682	6	19.947	21.896	0.001 ^b

1	Residual	57.393	63	.911
Total		177.075	69	

a. Dependent Variable: Operational performance

b. Predictors: (Constant), Information Flow Practices, Warehousing Practices, Inventory Management Practices, Transportation Practices

The study showed from the ANOVA statistics that the regression model had a significance value of 0,1%, suggesting that the results were ideal in concluding population parameters as the importance of significance (p-value) was less than 5%. This shows that all known logistical management activities have a dynamically substantial effect on logistics efficiency in the humanitarian organizations, the dependent variable was measured as having a greater value than its critical value (21.896>3.86). The value was less than 0.05, which suggested that the model was important and suitable for the collected data.

Table 7: Coefficients of Determination

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	1.543	.633		2.438	1.543
Inventory Management Practices	.479	.113	.334	4.239	.001
Transportation Practices	.428	.106	.314	4.038	.011
Information Flow Practices	.483	.113	.323	4.274	.003
Warehousing Practices	.471	.107	.327	4.402	.000

a. Dependent Variable: Operational performance

Table 4.13 above indicates that all predictors have positive and statistically relevant relationships with operating output at 95 % confidence point. The study's predictors were also high above the critical value of 3.182; that means the predictors are linked to their operations positively and statistically significantly. Positive effects were reported on all independent parts of the study of (high t-values p=0,05) for all of its independent variable, inventory management practices (t=4.239, p=0.001), transport (t=3.566, p=0.038), information flow practices (t = 4.274, p = 0.001) and warehouse practices (t = 4.402, p=0.000). Constant value (1,543) indicates that the operational efficiency of humanitarian organizations in Kakamega North Sub County would decrease by 1,543 if established Logistics Management activities were all graded to zero. This research presumed that the term stochastic error was 0 as the survey identified the key logistics management practices.

The study further revealed that: a unit increase in inventory management practices would lead to increase in operational performance by 0.479, a unit increase in transportation practices would lead to increase in the operational performance by 0.428, a unit increase in information flow practices would lead to a change in the logistical performance by 0.483 and a unit increase in warehousing practices of 0.471.

VI. RECOMMENDATIONS.

The main aim of this research was to evaluate the effect of logistics management activities on the success of humanitarian organizations in Kakamega North Sub-County, Kakamega; Kenya. On the question of whether the businesses had implemented various

types of logistics management practices, all respondents replied to the affirmative indicating that all of the firms examined had recognized the value of logistics management practices as a tool for enhancing the firms' operational efficiency.

The study found that Humanitarian Organizations use the Enterprise Resource Planning System (Barcode) to monitor their inventory and also allow the business to avoid bottlenecks in production inventory. The research also found that inventory management methods provide visibility of inventory in logistics or supply chain network upstream and downstream.

With regard to transport practices, the study showed that transport management practices enable customers to deliver their products and services in a timely manner through transport management products. The study showed that information flow through ICT is used by the humanitarian organizations in Kakamega North sub county to organize their activities in relation to the flow of information within the business. This has also been found that warehouses are located near the customer and goods are supplied to the consumer in the correct number. On operational performance parameters, the study found that effective and efficient logistics management practices have improved the utilization of the firm's storage capacity across its network.

The study aimed to establish the influence of logistics management practices on the logistics performance of humanitarian organizations in Kakamega North Sub County. The study established that all the four logistics management dimensions significantly influenced firm performance.

The study found that humanitarian organisations, including transport management practices that allow for timely deliveries of goods and services to consumers, employ logistic management practices, which help the organization to avoid inventory disruption in the production cycle. This implies that an increase in performance of manufacturing firm is likely through embracing transport management practices within logistics management.

On Inventory management, the study established a significant positive relationship between inventory management and logistics performance. A positive increase of transportation initiatives within the manufacturing processes increases the performance of firms. It is therefore concluded in the study that inventory management practices within the operations of the firm is positively significant on their performance.

Information flow management was found to have positive significant influence on the performance of manufacturing firms. As a result, the study concludes that there is a positive relationship between information flow management and logistics performance and it needs to be impressed at all level of operation to improve on performance

The research also found that warehouse management methods promote the delivery of goods to the customers and manufacturing activities in the appropriate quantity. In addition, the study found that warehouse management practices facilitated products delivery at the right quantity to the customers and packaging practices.

Based on the regression analysis the study established positive beta coefficients with all study variables, inventory management practices, transportation practices, information flow practices and warehousing practices. In that vein the study concludes that any change made is expected to positively impact logistical effectiveness and efficiencies.

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Detection and molecular typing of dengue virus circulating among febrile patients in a private tertiary institution in North Central Nigeria

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DOI: 10.29322/IJSRP.10.09.2020.p10514

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10514>

Abstract- There is still paucity of published data on dengue virus particularly its circulating serotypes in Nigeria and Africa at large. This study was however conducted to detect and type dengue virus (DENV) serotype(s) circulating among febrile patients in a private tertiary institution in North Central Nigeria. After informed consent, 400 blood samples were collected from febrile patients at the University Health Centre. The resulting sera were screened for DENV seromarkers (IgM, IgG and NS1) using Aria Dou DENV RDT kits (CTK Biotech, Inc, San Diego, USA) while all positive samples were serotyped by PCR using type specific primers. Data obtained were analyzed using Smith's Statistical Package (Version 2.8, California, USA) and p value of ≤ 0.05 was considered statistically significant. Of the 400 patients screened, 12(3.0%) were positive for acute and recent DENV infection. Age and gender of the patients were not associated with the infection ($p > 0.05$). However, it was higher among female subjects of age ≤ 20 years. Of the 12 positive samples serotyped, 7(58.3%) were of DENV-3 while the remaining 5(41.7%) were not-typable. Our findings confirmed the circulation of DENV-3 in the study area. Hence, there is need for the inclusion of dengue virus test in the routine diagnosis of febrile illnesses to avoid misdiagnosis and mistreatment.

Index Terms- Dengue, Febrile illness, Infection, Nigeria, Serotypes

I. INTRODUCTION

Dengue, also known as 'breakbone fever', is the fastest spreading vector-borne viral infection transmitted between humans by the day biting vector mosquitoes; *Aedes aegypti* and *Aedes albopictus* [1]. The infection is caused by one of four dengue virus serotypes (DENV-1, DENV-2, DENV-3 and DENV-4) belonging to the genus flavivirus within the *Flaviviridae* family and each serotype has different interactions with the antibodies in human serum [2]. Dengue virus contains a positive strand RNA with a spherical lipid envelope. The RNA genome codes for envelope, capsid and membrane structural proteins in addition to seven non-structural proteins. Infection with any of the dengue virus sub-types may result either in an asymptomatic infection or a febrile illness of varying severity ranging from mild illness to

more severe forms such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) [3, 4].

The disease is endemic to more than 100 countries in the tropical and subtropical regions of the world especially tropical Asia, Central and South America, Africa and the Caribbean [5, 6, 7]. This infection is rapidly expanding and its global footprint is a public health challenge with an economic burden [7, 8].

Early signs and symptoms of dengue virus infection are indistinguishable from those of other tropical disease such as malaria and typhoid. However, infected individuals may be asymptomatic but sometimes they may present with dengue fever (DF), dengue hemorrhagic fever (DHF), or Dengue shock syndrome (DSS) [4, 7].

A vaccine for dengue fever has been approved and is commercially available in a number of countries [7]. Other methods of prevention include reducing mosquito habitat and limiting exposure to bites [7] while treatment of acute dengue is supportive and includes giving fluid either by mouth or intravenously for mild or moderate disease. For more severe cases, blood transfusion may be required [9].

The surveillance of dengue virus infection in Nigeria is affected by the lack of routine laboratory diagnosis which may include culture, polymerase chain reaction (PCR), and serological assays [10]. The true incidence and impact of dengue fever in Nigeria is unknown and this could be attributed to the fact that it is not a reportable disease in Nigeria. Most cases are often, misdiagnosed as malaria, typhoid or referred to as pyrexia of unknown origin [11]. In Nigeria where malaria and typhoid are highly endemic, most cases of febrile illness are likely to be treated as presumptive malaria or typhoid some of which often resist anti-malaria and antibiotic treatment [12].

Dengue and malaria infections have similar geographical areas of distribution, and similar factors encourage the spread of both infections [13, 14]. For instance, due to poor drainage system, poor environmental sanitation of the villages surrounding the University, the University is in its self-surrounded by bush and streams which may result in infestation of the day-biting mosquitoes that transmit dengue infection and night biting mosquitoes that spread Malaria. Thus an existence of high dengue burden where malaria and typhoid are endemic may be expected. Therefore, this study was conducted to detect and type dengue virus circulating among febrile patients in a tertiary institution in North Central Nigeria.

II. MATERIALS AND METHODS

2.1 Study area

The study was conducted among patients that visited Bingham University Health Centre, Karu, Nigeria. This is a facility that provides health care services majorly to students and staff of the University and also to people living in the neighboring communities.

Bingham University is located around kilometer 25 Keffi-Abuja express way, Auta-Baleifi in Kodape District, Karu Local Government Area of Nasarawa State [15].

2.2 Ethical clearance

The ethical clearance for this study was obtained from Research and Ethical Committee of Bingham University Teaching Hospital Jos, Plateau State, Nigeria.

2.2 Study population

The study population consisted of male and female adults Bingham University students, staff and members of the neighboring communities that accessed the University Health Centre from February to July, 2017. Each participant was consented and socio-demographic information was obtained from them by the use of a designed questionnaire.

2.3 Sample size determination

The sample size was determined using the formula by Naing *et al.* [16] for sample size calculation a 0.05 level of precision:

$$n = \frac{Z^2pq}{d^2}$$

Where:

n = derived minimum sample size if the target population is > 10,000.

Z = standard normal deviation at the required confidence interval (1.96) which corresponds to 95% confidence interval.

p = Expected prevalence rate (6.0%) (0.1) [11].

q = 1 - p = 0.9

d = degree of accuracy/precision expected i.e. 0.05

$$\begin{aligned} n &= \frac{(1.96)^2(0.1)(0.9)}{(0.05)^2} \\ &= \frac{3.8416 \times 0.09}{0.0025} \\ &= \frac{0.3457}{0.0025} \\ &= 138.29 \\ n &= 138 \end{aligned}$$

This was however rounded up to 400 samples.

2.4 Sample collection, processing and storage

A total of 400 blood samples were collected from febrile in and out patients seeking medical care at Bingham University Health Centre, from February through July, 2015. About 3 ml of venous blood sample was collected from each participant aseptically into an EDTA container. The serum was obtained after centrifugation at 1,200 revolutions per minute for 5 minutes [17]. The plasma was stored at -20°C until ready for use.

2.5 Laboratory analysis

2.5.1 Detection of dengue virus seromarkers

All samples were screened for the presence of dengue virus Immunoglobulin G (IgG), Immunoglobulin M (IgM) and dengue virus antigen (NS1 Ag) using Aria Dou dengue virus rapid diagnostic test kit (CTK Biotech, Inc, San Diego, USA). The test was conducted and interpreted according to manufacturer's instructions.

2.5.2 Molecular characterization of dengue virus

A molecular typing system based on reverse transcriptase polymerase chain reaction (RT-PCR) using type-specific primers was used for the detection of the four dengue virus serotypes (DENV-1, DENV-2, DENV-3 and DENV-4) according to previously described methods [18].

2.5.2 Reverse transcriptase polymerase chain reaction (RT-PCR)

RT-PCR was carried out in two rounds with MJ Research PTC-100 programmable thermal cycler (MJ Research Inc., Watertown, USA), using oligonucleotide primers that were adopted from the work of Lanciotti *et al.* [19]

2.5.3 Dengue virus RNA extraction

The viral RNA was extracted from dengue virus positive samples using QIAamp Viral RNA isolation kit (QIAGEN, Hilden, Germany) according to the manufacturer's instructions.

2.5.4 RT-PCR procedure

In a single tube, viral RNA was converted to a DNA copy (cDNA) prior to enzymatic DNA amplification by the use of reverse transcriptase (RT) and the DENV downstream consensus primer D2-5'-TTGCACCAACAGTCAATGTCTTCAGGTTTC-3' homologous to the genomic RNA of the four serotypes (DENV-1, DENV-2, DENV-3 and DENV-4). Subsequent Taq polymerase amplification was performed on the resulting cDNA with the upstream dengue virus consensus primer D1-5'-TCAATATGCTGAAACGCGCGAGAAACCG-3'. Target RNA was amplified in 25 µL volumes containing the following components: 800mMdeoxynucleotide triphosphates (dNTPs), 8mM dithiothreitol, 0.24 µM each of primers D1 and D2, 0.5U of AMV RT (Promega, Madison, WI, USA), and 0.625U of Dreamtaq DNA polymerase (Fermentas Inc., USA). The reactions were allowed to proceed for 1 h at 42°C and then to proceed with 95°C for 3 minutes for initial denaturation followed by 35 cycles of denaturation (95°C for 30 sec), primer annealing (55°C for 1min), and primer extension (72°C for 2min) along with final extension (72°C for 5 min).

DENV serotyping was conducted by second-round amplification (nested PCR) initiated with 10 µ of diluted material (1:100 in sterile distilled water) from the initial amplification reaction. The total 20 µL of reaction mixture was prepared using 2 µL of diluted first PCR products, 0.8mM dNTPs, 0.5U of Dreamtaq DNA Polymerase and 0.3 µM of primer D1 and 0.3µM of dengue virus typespecific primers: TS1 5'-CGTCTCAGTGATCCGGGG-3', TS2 5'-CGCCACAAGGGCCATGAACAG-3', TS3 5'-TAACATCATCATGAGACAGAGC-3', and TS4 5'-CTCTGTTGTCTTAAACAAGAGA-3'. Dithiothreitol and AMV RT were eliminated. The samples were subjected to initial denaturation (95°C for 3min) followed by 20 cycles of

denaturation (95°C for 30 s), primer annealing (55°C for 1min), and primer extension (72°C for 1min) along with final extension (72°C for 5min). The PCR products were analyzed by running a 1.5% agarose gel stained with ethidium bromide.

The sizes of PCR products were estimated in relation to the migration pattern of a 100bp to 1000bp increments plus DNA molecular marker (BIONEER Daejeon, North Korea). The results were interpreted considering the specific size of each serotype as follows; 482bp for serotype 1, 389bp for serotype 2, 290bp for serotype 3 and 114bp for serotype 4.

2.6 Data analysis

The information obtained from the questionnaires and results of laboratory tests were analysed using Smith's Statistical Package (version 2.8, California, USA). Descriptive Statistics were presented in table and figure. Chi-square test was used to determine the relationships between the socio-demographic data and the prevalence of dengue virus infection. *P* value of ≤ 0.05 was considered statistically significant at 95% confidence interval.

III. RESULTS AND DISCUSSION

In Nigeria, most cases of febrile illnesses are often misdiagnosed and/or mistreated as presumptive malaria or typhoid some of which often resist antimalaria and antibiotic treatment [11, 12]. In this study, 400 patients with febrile illnesses attending Bingham University Health Centre were screened for dengue virus infection. Dengue virus IgM, IgG and NS1 were used as surrogates for the detection of dengue virus infection. Of the 400 patients screened in this study, 12(3.0%) were positive for both NS1 antigen and IgM antibody while none (0%) of the patient was

positive for IgG antibody (Figure 1). This is an indication that there was no past exposure to the virus in the study population (since IgG antibody was negative) rather positive cases (3.0%) were of acute and recent infection [11].

The 3.0% prevalence of dengue virus infection recorded in this current study is higher than the 2.3% reported by Onyedibe *et al.* [11] in Maiduguri and Jos, 2.2% by Dawurung *et al.* [20] Jos and 1.8% by Idoko *et al.* [10] in Kaduna. However, much higher prevalence were reported especially from the Southern region of the country. These include the 17.2% in Ogbomosho [21], 25.7% Ile-Ife [22] and 35.0% in Ibadan [23]. Studies from other parts of Sub-Saharan Africa also show higher prevalence between 21-26.3% of the viral infection [24, 25, 26]. The climatic conditions in the rainforest region of Southern Nigeria which support increased mosquito breeding than the dry Sahel region of Northern Nigeria may possibly account for the higher prevalence reported in Southern Nigeria and other parts of Africa [27].

There is no significant association between prevalence of dengue virus infection with age and gender in this study ($P > 0.05$). This is an indication that regardless of age and gender, all patients are equally susceptible to the virus (Table 1). However, the higher prevalence recorded among females of age ≤ 20 years in this study is consistent with the reports of other previous studies [22, 28].

There is still paucity of published data on DENV particularly its circulating serotypes in Nigeria and Africa at large. In this study however, all the 12(3.0%) samples positive for DENV were serotyped by a molecular typing system based on RT-PCR using type-specific primers for the detection of the four DENV serotypes (DENV-1, DENV-2, DENV-3 and DENV-4). Of the 12 samples serotyped, 7(58.3%) were of DENV-3 while the remaining 5(41.7%) samples were not-typable (Figures 2 and 3).

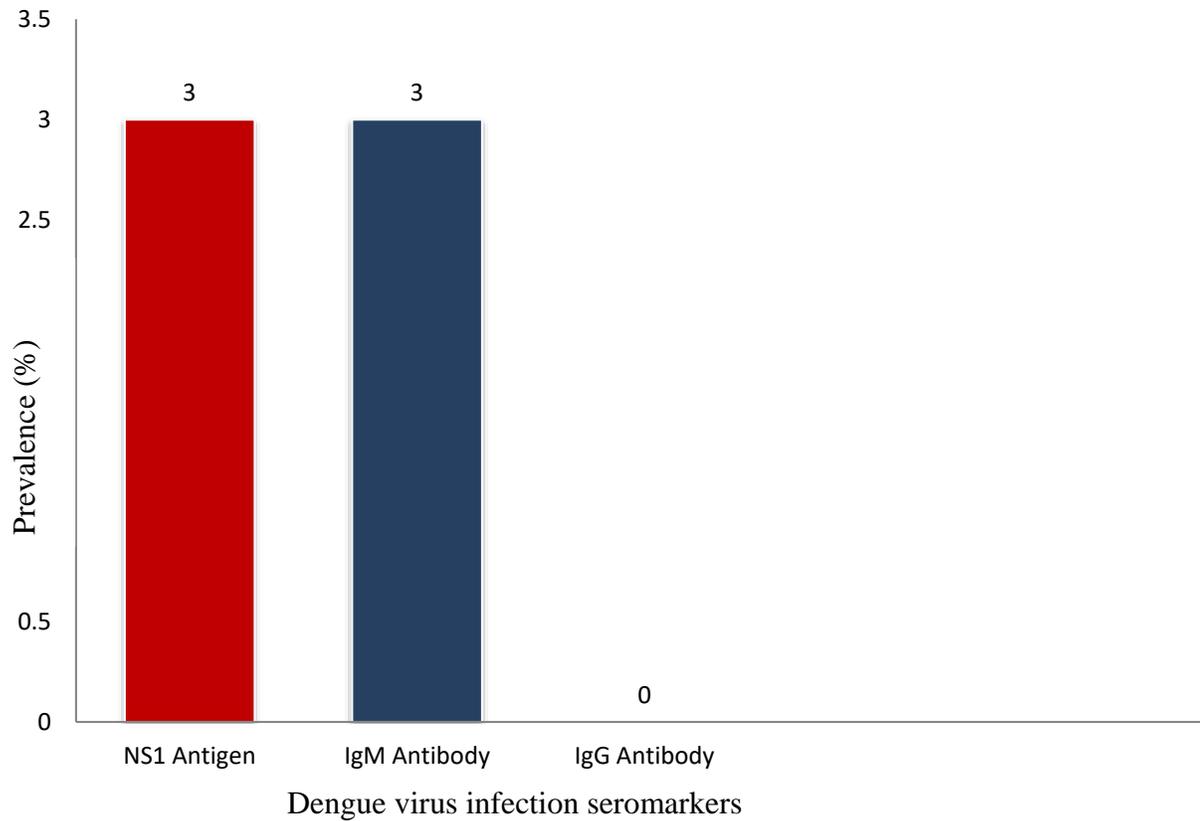


Figure 1: Prevalence of dengue virus infection seromarkers among febrile patients in a private tertiary institution in North Central Nigeria.

Table 1: Prevalence and distribution of dengue virus infection among febrile patients in a private tertiary institution in North Central Nigeria in relation to age and gender

Parameter	No. Examined (N=400)	No. Positive (N=12)	Prevalence (%) (Overall=3.0%)	P-value
Age (Years)				
≤20	242	9	3.7	0.1480
21-30	116	3	2.6	
≥30	42	0	0.0	
Gender				
Male	204	3	1.8	0.0506
Female	194	9	4.6	

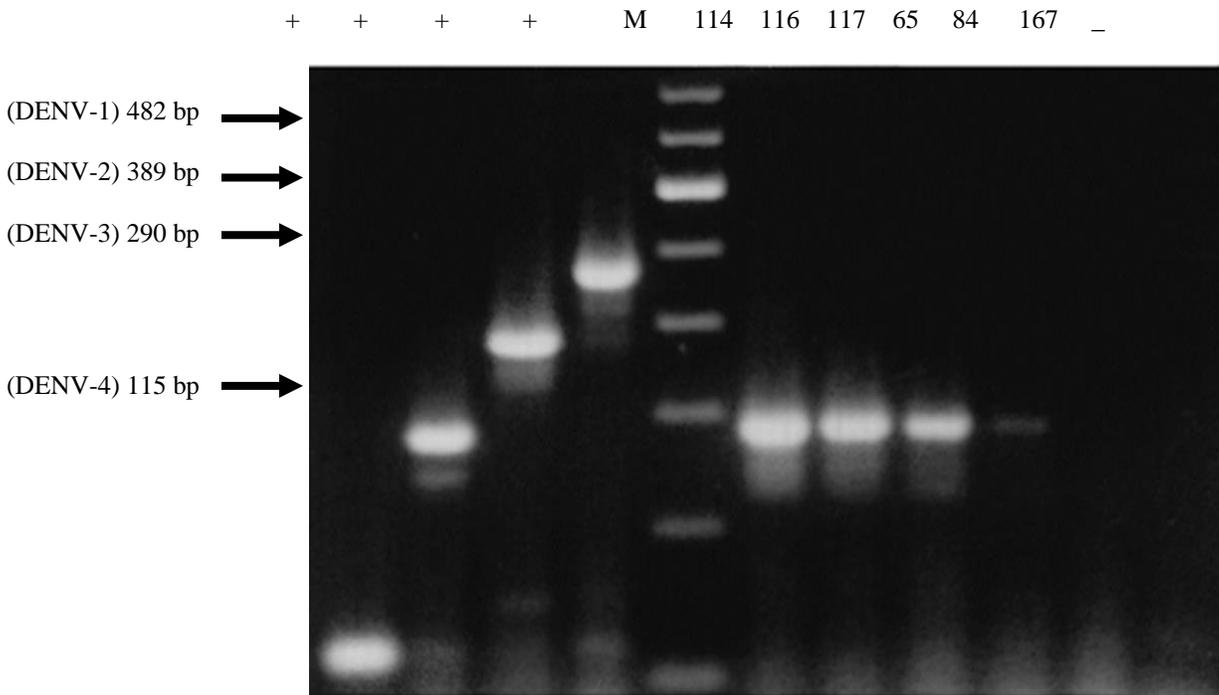


Figure 2: Results of dengue-specific RT-PCR followed by second round nested PCR of RNA samples, showing band in 1.5% agarose gel electrophoresis stained with ethidium bromide. Lane M: 100 bp DNA ladder, 482 bp for DENV-1, 389 bp for DENV-2, 290 bp for DEN-3, 114 bp for DENV-4, + for positive controls and – for negative control.

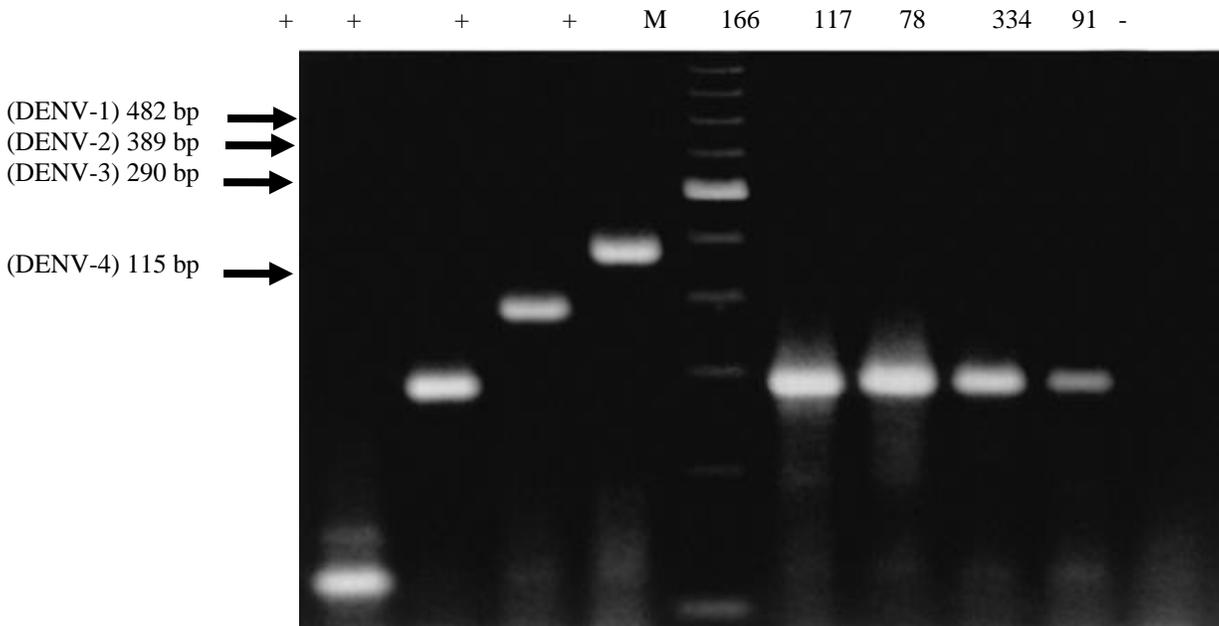


Figure 3: Results of dengue-specific RT-PCR followed by second round nested PCR of RNA samples, showing band in 1.5% agarose gel electrophoresis stained with ethidium bromide. Lane M: 100 bp DNA ladder, 482 bp for DENV-1, 389 bp for DENV-2, 290 bp for DEN-3, 114 bp for DENV-4, + for positive controls and – for negative control.

The detection of only DENV-3 in this study implies that the infection in the study population is monotypic with a single serotype. Furthermore, 5(41.7%) DENV positive samples were not-typable in this study and this might probably be due to mutation in the viral genome, errors in DNA extraction protocols or PCR procedures.

All the four DENV serotypes (DENV-1, 2, 3 and 4) have been detected in Nigeria [6, 29, 30] with predominance of DENV-3 [29, 30, 31, 32]. DENV serotyping is of medical importance because each serotype has different interactions with the

antibodies in human serum [2]. That is, infection with any serotype produces antibody which does not give long-lasting homologous immunity which does not confer protection against other serotypes [33].

IV. CONCLUSION

This study recorded 3.0% prevalence of acute and recent DENV-3 infection among patients with febrile illnesses at Bingham University Health Centre, Nigeria. The present of the infection in the study area which was found to be higher among female subjects of age ≤ 20 years calls for alarm particularly in Nigeria where it may be misdiagnosed and mistreated as malaria or typhoid.

ACKNOWLEDGMENT

The study team would like to thank the management of Bingham University Karu, Nigeria for their kind permission to conduct the research. We also thank the study participants who voluntarily participated in the study. However, this research did not receive any form of grant from governmental or non-governmental organizations.

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Influence of Problem Solving Approach on Secondary School Students' Mathematics Achievement by School Type in Vihiga County, Kenya

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DOI: 10.29322/IJSRP.10.09.2020.p10515
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10515>

Abstract- In Kenya, the fundamental challenge facing learning of mathematics in secondary schools is how to enhance students' conceptual understanding associated with the learning process. Based on this challenge, the study investigated the influence of using Problem Solving Approach on secondary school students' mathematics achievement by school type. The purpose of this study was to determine whether the use of Problem Solving Approach had any influence on students' mathematics achievement by school type. Students from one hundred and nine schools from Vihiga County formed the population of the study. Stratified random sampling was used to select twelve schools from the 109 schools. The population of the study was 1459 Form Three students selected from the twelve schools that participated in the study. The sample size of 727 students was selected from the 109 schools by the use of purposive and simple random sampling techniques. The Solomon Four-Group design was used in the study. The respondents were assigned in their intact classes to four groups; experimental groups 1 and 3, and control groups 2 and 4. All the groups were taught the same content of the topic Commercial Arithmetic. However, groups 1 and 3 were taught using Problem Solving Approach while groups 2 and 4 were taught by conventional methods. Groups 1 and 2 were pre-tested prior to the implementation of the Problem Solving Approach treatment. Mathematics Achievement Test 1 and Mathematics Achievement Test 2 were used to collect data. The instruments' validity was determined by the researcher, a panel of mathematics educators from the Department of Science and Mathematics Education at Masinde Muliro University of Science and Technology and experienced secondary school mathematics teachers. Reliability coefficients of 0.795 and 0.872 were obtained for Mathematics Achievement Test 1 and Mathematics Achievement Test 2 respectively using Cronbach's Coefficient alpha formula. After the treatment, all the four groups were post-tested. The results showed that increased students' learning occurred among students in the three types of schools and more significantly in the County schools in comparison to the National and Sub-county schools when Problem Solving Approach was used. The study concluded that Problem Solving Approach is a more effective teaching approach to the students in the County schools in comparison to those in the National and Sub-county schools. Therefore, mathematics educators should encourage mathematics teachers to use it and

teacher educators to make it part of the teacher-training curriculum.

Index Terms- Problem Solving Approach, Secondary School, Mathematics Achievement, School Type.

I. INTRODUCTION

M1.1 Background to the Study

Mathematics is one of the core subjects in the Kenya secondary school curriculum. It is an examinable subject for all students (Kenya Institute of Education [KIE], 2006). Much importance is currently attached to it by the society. As a tool, it finds its application in daily lives at home, in the office and in scientific and technological fields. Despite its importance, students have consistently performed poorly in the subject. This is evident from the Kenya Certificate of Secondary Education (KCSE) examination results. The years 2006, 2007, 2008 and 2009 recorded low mean scores of 38.08, 39.46, 42.59 and 42.26 respectively (KNEC, 2010). The mean score figures indicate that there was a slight decline in the overall mean score in the year 2009 compared to the previous year. However, the general performance in the subject is poor as depicted by the low mean scores. This poor performance was attributed to poor teaching and/or learning strategies (KNEC, 2009).

In the recent past, teaching and learning practices have undergone changes of revolutionary proportions; changes underpinned by shifts in psychological and pedagogical theory in teaching and learning process. The new developments advocates for new approaches to mathematics teaching and learning, not only in secondary schools but also in teacher education (Okigbo & Osuafor, 2008). Research findings on learning and memory show that for learning to be effective, the learner should be actively involved in the learning process (Lambros, 2002). Piaget believed that there is no true learning unless the students mentally act on information and in the process, assimilate or accommodate what they encounter in their environment. Unless this assimilation occurs, teachers and students are involved in pseudo-learning, which is knowledge retained only for short time. Efforts made to translate these new conceptions of learning into classroom practices include development of instructional methods that engage the learner actively in the process of

knowledge acquisition. Mathematical problem solving is a teaching approach that is learner-centred. It may improve and motivate students' learning, problem solving skills and broad mathematics knowledge, based on deep understanding and problem solving (Major *et al.*, 2000)

Cognitive psychology research has provided considerable insight into the way the learners acquire and organize knowledge. A growing body of research today points to active learning strategies in which the students listen, talk, write, read and reflect as they become directly involved in the instructional process (Roh, 2003). Constructivist theories of learning which had its roots from cognitive psychology place the learner in an active role of knowledge construction. The learner approaches a domain with some prior knowledge about the subject matter constructed from personal experiences, schooling, and social interactions (Okere, 1996). Concepts change as the learner attempts to connect new information with existing conceptual framework. According to constructivist theories of learning, conceptual change in learners should be facilitated by problem solving activities such as having students actively engaged in processing knowledge; confronting their conceptual framework; confronting defending alternatives perspective; linking new concepts to old; and using strategies that encourages both meta-cognition and higher order thinking (Walker & Lofton, 2003).

Effective strategies designed to promote efficient and meaningful learning rely upon connecting prior knowledge to new concepts (Okerere, 2006). The importance of meaningful learning in promoting conceptual understanding that in turn facilitates problem solving was stressed by Bransford and Stein (1984), Eylon and Linn (1988) and Mangle (2008). Research in different areas in mathematics and in other subjects has established the existence of positive relationships between students' meaningful learning approaches and their achievement in mathematics (Wentzel, 2002; Boaler, 2002; Samuelsson, 2008). According to Ramsden (1995) meaningful learners have a deep approach to learning. They tend to build a holistic description of content, reorganise new content by relating it to prior knowledge and/or to personal experiences, are inclined to use evidence, and maintain a critical and a more objective view. Conversely, rote learners have a surface approach to learning; they have a propensity for memorisation of mathematics facts, concepts, principles and strategies and are motivated extrinsically by fear of failure rather than the need to learn and understand.

Students' learning difficulties can often be attributed to ineffective or inappropriate cognitive processes (Herreid, 2003). Earlier, Ramsden (1995) contended that approaches to learning are associated with learning outcomes. According to Novak and Gowin, meaningful learning occurs when individuals choose to relate new knowledge to relevant concepts and propositions they already know (Novak & Gowin, 1984). This calls for commitment on the part of the learner to link new concepts with higher order and more inclusive concepts that are already understood by the learner that can serve to anchor new learning and assimilate new ideas (Novak, 1998).

The persistently low enrollment in mathematics-oriented courses particularly in tertiary institutions have aroused concern of mathematics educators, researchers and policy makers the world over (Changeiywo, 2001; Githua, 2002). As a result most

countries are seeking to improve their mathematics education standards by promoting programs that not only enhances effective acquisition of rapidly growing bodies of mathematics knowledge in a well organized framework, but also promotes the learners' capability to learn mathematics meaningfully (Novak, 1998). In practice, while the preponderance of scientific effort swirls around experimental achievements, conceptual achievements continue to be astoundingly important in the overall advancement of mathematics (Wagner & Benavente-McEnery, 2006). If mathematics education aims at preparing students who can think logically and conceptually; solve traditional as well as novel mathematics problems; work efficiently with confidence and accuracy; use meaningful problem solving strategies and are committed to pursuing the study of mathematics; then the focus should be on teaching for understanding rather than students memorising mathematics facts, skills, concepts, principles and strategies (Cooper & Robinson, 2000).

Many students in Kenya perform poorly in mathematics. The poor performance is mainly attributed to poor teaching and learning strategies. It is this poor performance that prompted the Government of Kenya through the Ministry of Education, with assistance of the Government of Japan through Japan International Co-operation Agency (JICA), to initiate a program on Strengthening of Mathematics and Science in Secondary School Education (SMASSE, 2003).

The importance of good teaching cannot be overemphasized. Good teaching encourages high quality learning (Ramsden, 1995). According to Mondoh (2000), students' difficulties in solving problems in mathematics may be traced to: poor understanding of the basic concepts, dependence on algorithms, and inability to apply what they knew, among others. The teaching of mathematics is not just about dispensing rules, definitions and algorithms for students to memorize. There is need to engage students as active participants through discussions and collaboration in problem solving among themselves. If students are given the opportunity to explain or clarify mathematical ideas, more meaningful learning results. Lau (2009) alludes that the mathematics skills required for the youth of today and the adults of tomorrow to function in the workplace are distinct from that for the youth and adults of yesterday. In terms of the 21st century pedagogy, the development of education now requires teaching strategies that emphasize students' involvement (Silva, 2009). Much success lies in students being able to communicate, share and use information to solve mathematical problems. According to Johnson and Johnson (1995), to achieve success in learning mathematics, learners should be given the opportunity to communicate mathematically, reason mathematically, and develop self confidence to solve mathematics problems.

An analysis of the KCSE examination question papers indicates that questions on Commercial Arithmetic keep recurring year after year, yet no marked improvement has been realised in terms of student performance in the topic even as the general performance in mathematics remains poor (KNEC, 2010). This suggests that students have a problem with this topic. The poor performance depicted by students in this topic portrays inadequate understanding of concepts in it. Teachers have been blamed for using inappropriate instructional techniques in

teaching this topic. Techniques that promote student-centred learning are seldom used. This is due to poor instructional approaches used in teaching mathematics (Mondoh & Yadav, 1998; Githua, 2001; Changeiywo, 2001; KNEC, 2010). It is however important that students perform well in this topic since Commercial Arithmetic gives useful information applied in daily life at home, in accounts and in commerce (KIE, 2001).

In Kenya, previous studies on performance in mathematics education concentrated on the direct effects of students' background factors and school environment, students' attitudes and type of instruction (Kirembu, 1991; Makau & Coombe, 1994). Mondoh (1995) identified teaching effectiveness, which is influenced by the teaching approach, as the most significant variable in mathematics achievement.

Problem Solving Approach (PSA) has been widely accepted as the way to teach vocational agriculture. On effects of level of PSA to teaching on students' achievement and retention, Boone (1990) found that students' level of achievement and retention was highest when PSA to teach was used. In the same study, Boone found that for high level cognitive items, students taught by PSA exhibited lower achievement loss than those taught by subject matter approach. In an earlier study, Boone (1988) found that high school agriculture students taught using PSA first in an instructional series had higher achievement scores than those taught first using a subject matter approach. Consequently to achieve effective learning and good performance in mathematics, the topic of Commercial Arithmetic need to be taught using student-centred approach. Zechariah (2010) contends that instructional methods employed by the teacher play a significant role in the acquisition of skills and meaningful learning. Instructional methods such as lecture make students become passive and have less interaction with each other in doing tasks. Changeiywo (2001) asserts that the lecture method adopted in schools makes students to be isolated from one another, leading to a high failure rate in sciences and mathematics. Changeiywo is of the view that positive changes take place when a teacher changes the teaching method toward a more student-centred approach. Consequently, an alternative method for the delivery of mathematics knowledge is PSA.

According to Mangle (2008), PSA involves students working in small groups to achieve a common goal, under conditions of positive interdependence, individual accountability, appropriate use of collaborative skills and face-to-face interactions. PSA is the instructional use of small groups through which students work together to maximize their own and each others' learning. Problem solving has its foundation in social-constructivist perspectives of learning. In this approach, the classroom environment is characterized by co-operative tasks and incentives structures and by small group activities. It can be used to teach 'hard' topics in mathematics and also help teachers to accomplish important social learning and human relations goals. Mangle provides benefits on the use of the PSA on students' achievement in mathematics as: students achieve higher grades; develop positive attitude towards mathematics and their social skills are enhanced. PSA also promotes deep learning of materials and help students to achieve better results in mathematics.

PSA has been shown to lead to improved achievement in mathematics to senior students and those in colleges. Samuelsson

(2008) found that PSA teaching approach is more effective than the conventional methods in the academic success of students. Segzin (2009) posits that in PSA sessions, students tend to enjoy mathematics, and this enjoyment motivates them to learn. Several researches on PSA have been on senior students and those in colleges in the Western environment. Hence, it was less clear whether PSA could be successfully applied to secondary school students in other countries in which social, religious, educational, and cultural practices are different from those of the Western countries. It is against this background that the current study investigated the influence of PSA on students' mathematics achievement in Commercial Arithmetic in Kenya.

From the foregoing, none of the studies so far sought to find out how PSA influences students' mathematics achievement with an aim of promoting meaningful learning. In an attempt to fill this gap, the current study investigated the influence of PSA on secondary school students' mathematics achievement by school type in Commercial Arithmetic in secondary schools in Vihiga County.

1.2 Purpose of the Study

The purpose of this study was to investigate the influence of Problem Solving Approach (PSA) on secondary school students' mathematics achievement by school type in Commercial Arithmetic.

1.3 Objective of the Study

The specific objective of the study was to determine whether there is any difference in achievement of students taught using Problem Solving Approach (PSA) in National, County and Sub-county schools

1.4 Hypothesis of the Study

The following null hypothesis was tested at an alpha level of 0.05:

HO₁: There is no significant difference between the achievement scores of students taught using PSA in National, County and Sub-county schools.

II. LITERATURE REVIEW

2.1 Problem Solving Approach and Achievement in Mathematics

PSA is a constructivist teaching model based on the assumption that learning is a product of cognitive and social interactions originating in a problem focused environment (Greeno *et al*, 1996). The theoretical philosophy of this approach is derived from John Dewey and discovery learning (Rheme, 1998). Fundamentally, PSA is an educational method in which students develop critical thinking and problem-solving skills in addition to developing an understanding of grasping essential concepts through the analysis of real-life problems (Duch, 1995). Learning takes place throughout a process where learners solve problems in groups. Barrows (1996) labels the main characteristics of PSA as: learning is student-centred and takes shape in small groups of students; teacher act as moderator and facilitator; the problems provide motivation for learning and organizational focus as well as the basis for the advance in

problem-solving skills; and self-directed learning aids the acquisition of new information. Besides equipping students with knowledge, PSA could also be employed to improve their problem solving skills, critical and creative thinking abilities, lifelong learning aptitudes, communication skills, group cooperation, adaptation to change and self-evaluation abilities, and enables them to build a far more positive approach to learning (Albanese & Mitchell, 1993).

In PSA, students act as professionals (Gallagher *et al.*, 1999). They are confronted with problems that require clear defining and well structuring, developing hypothesis, assessing, analysis, utilizing data from different sources, revising initial hypothesis as the data collected, developing and justifying solutions based on evidence and reasoning. PSA has been used as an educational tool to enhance learning as a relevant and practical experience, to have students' problem solving skills and to promote students' learning skills. Eng (2001) opined PSA as a philosophy aims to design and deliver a total learning that is holistic to student-centred and student empowerment. Presenting the students with a problem, gives them opportunity to take risks, to adopt new understandings, to apply knowledge to work in context and to enjoy the thrill of being discovers.

Tick (2007) underscores that in the student-centred learning environment that is desirable for PSA, the student is the central figure of the learning-teaching process. The learning objective is not the reproduction, recall and learning of passively received learning material. Rather, it is the active and creative engagement of students in group work and in individual study, thus transferring the skills and knowledge. The individual, autonomous self-directed learning gives the freedom to the learner to decide individually and consciously on the learning strategy and on the time scale to follow. Students have the opportunity to express their ideas and justify their answers verbally. They also have opportunities to engage in cognitively demanding questions (Hiebert & Wearne, 1993).

In PSA, the teacher acts as a facilitator. Roh (2003) argues that within problem solving learning environments, teachers' instructional abilities are more critical than in the traditional teacher-centred classrooms. Beyond presenting knowledge to the students, teachers must engage students in marshalling information and using their knowledge in applied and real settings. In teaching through problem solving, the discussion of a problem and its alternative solution takes longer than the demonstration of a routine classroom activity. Hiebert and Wearne found that classrooms with a primary focus on teaching through problem solving used fewer problems and spend more time on each of them compared to those classrooms without a primary focus on problem solving. Moreover, in problem solving classrooms, teachers ask more conceptually-oriented questions and fewer recall questions than teachers in the conventional classrooms. They also decide the aspects of a task to highlight, how to organize and orchestrate the work of students, what questions to ask to challenge those with varied levels of expertise, and how to support students without taking over the process of thinking for them and thus eliminating the challenge (Stigler & Hierbert, 1999). Thus it is the teacher's role to develop students' reasoning skills. As Weber (2008) avers, "To lead students to develop accurate criteria for what constitutes

a good argument, the teacher must have a solid understanding of these criteria" (p. 432).

Learning takes place during the process of problem solving. As students solve problems, they can use any approach they can think of, draw on any piece of knowledge they have learned, and justify their ideas in ways they feel are convincing. The learning environment provides a natural setting for students to present various solutions to their group or class and learn mathematics through social interactions, meaningful negotiations, and reaching shared understanding. Such activities help students clarify their ideas and acquire different perspectives of the concept or idea they are learning (Lester & Charles, 2003).

PSA has important cognitive learning outcomes such as subject achievement, retention, problem-solving skills, learning strategies, approaches to learning (Berkel and Dolmans, 2006; Chin and Chia, 2004). Problem-based tutorial groups positively influence learning. In studies focusing on the cognitive effects of small groups PSA, activation of prior knowledge, recall of information, causal reasoning or theory building, cognitive conflicts leading to conceptual change and collaborative learning construction take place during discussions (Dolmans and Schmidt, 2006). In PSA, students follow a certain pattern of exploration which begins with the consideration of a problem consisting of occurrences that need explanations. During discussion with peers in groups, students try to identify the fundamental principles or processes. Students then stimulate their existing knowledge and find that they need to undertake further study in certain areas. As a result of this, students research the necessary points and then discuss their findings and difficulties within their groups. The discussions held in groups contribute to students' cognitive learning positively (Dolmans *et al.*, 2001).

PSA impacts students' motivation for learning optimistically. A certain cognitive process (i.e. intrinsic interest in subject matter) is facilitated by the process entailed in PSA (Schmidt, 1993). By discussing the subject matter in groups, students become engaged which in turn influences their inherent interest in the subject matter (Dolmans & Schmidt, 2006). Students' intrinsic interest motivates them to develop a full understanding of all the components needed for its solution (Grooves, 2005). Consequently, these cognitive and motivational benefits of PSA have a positive resultant impact on student's academic achievement.

According to Dart *et al.* (2000), PSA produces deep learning which is a modernist method where the learner actively participates in the learning task so as to reshape the knowledge provided. The surface learning is a product of the conventional method where the learner is completely passive waiting for the teacher to transfer the information directly. Researches have proved that students get influenced by their perceptions of the learning environment when selecting an approach to learning (Mayya *et al.*, 2004). In earlier studies, Raimsdan and Entwistle (2010) reported that teaching characteristics such as the methods of learning employed in classes, the teacher's enthusiasm, the level of the knowledge being taught and the pace of progression have a great impact on students' achievement. Margetison (2008) noted that conventional methods of teaching encourage the learner to adopt the surface learning approach; and that it is PSA method that integrates the four vital elements of the deep learning approach; that is a well-structured knowledge database, active

learning, interaction through co-operation and the conditions planned in a way to increase intrinsic motivation.

Mathematical problems are well structured in that they are clearly stated, have known solutions and are evaluated against well known undisputed criteria. Biehler and Snowman (1997) indicate that mathematical problems have given information, obstacles and a goal. According to Polya (1973) the four steps that can help a learner to successfully solve mathematical problems are: identification of the problem, which depends on curiosity and interest of the learner in the subject matter; understanding of the nature of the problem based on specific-domain knowledge and familiarity with problem types; recall of mathematical facts and consultation with other relevant source for the required information in a problem; and formulation and implementation of solution to a problem through; use of algorithms, heuristics, study of worked examples, solution of similar but simpler examples, solving analogous problems, and evaluating the solution by estimating or checking its solution.

In regard to mathematics specifically, a difficulty in some curricular is that algorithms are taught out of context. Lochhead and Zietsman (2001) argue that teaching must be done within the context in order to avoid students' perfunctory performance on algorithms alone. They further assert that much emphasis is on general-purpose strategies that can be applied across a range of mathematical contexts. Beyer (2001) supports Polya's four-step sequence of introducing mathematical problem solving. The teachers reinforce this strategy and elaborate upon it as student progress through the classes, using it as a framework for a variety of solution plans and formulae.

Cook (2001) stresses tasks that engage students in problem-solving and mathematics reasoning. He argues that quality rather than quantity should rule the day in problems that are thought-provoking and those that challenge students' curiosity. Students can also gain from learning strategies such as: trial-and-error, drawing a diagram or model, process of elimination, looking for patterns, simplifying the problem, working backwards, organizing information and then writing an equation. Lochhead and Zietsman (2001) contend that good problem-solvers have these strategies as part of their repertoire. Besides, they have a positive and determined attitude about problem-solving, and awareness in the sense of understanding *how* they solved the problems. This study adapted Polya's problem solving heuristics during mathematics instruction.

Studies involving elementary students showed that students taught through the PSA had higher levels of mathematical understanding and problem solving skills on a computation test than those taught with the conventional methods

(Fuson *et al.*, 2000). Other studies involving middle school students (Romberg & Shafer, 2002) revealed that students taught with the Problem Based Instruction had higher levels of mathematical understanding than the students taught by the traditional instruction. Earlier, Wood and Sellers (1997) found that students who received problem-centred mathematics-instruction had significantly higher achievement on standard achievement measures and better conceptual understanding than did those students who had received the traditional instruction. In studies involving pre-service Physics teachers, those taught through problem based learning instruction had higher levels of achievement in comparison to those who received instruction through the traditional methods (Sahin, 2010; Segzin, 2009).

2.2 School Type and Achievement in Mathematics

Vihiga County has national, county, sub-county and private schools. National, county and sub-county schools were used in the study. This is so because students' achievement in mathematics in the three types of schools is not the best. This makes it paramount to seek for a strategy for teaching mathematics that aims at improving its understanding and achievement by students in the three types of schools. Consequently, the researcher's main intention was to investigate the influence of using PSA on student's achievement in the national, county and sub-county schools.

Although the literature reviewed supports the benefits of PSA in mathematics instruction, none of the studies focused on the influence of PSA on students' mathematics achievement in national, county and sub-county schools in Vihiga County. Thus, this study investigated on the influence of PSA on students' achievement in mathematics by school type in Vihiga County secondary schools.

III. RESEARCH METHODOLOGY

3.1 Research Design

The study adopted Solomon's Four Group Design that employed the quasi-experimental procedures. This is because secondary schools classes once constituted exist as intact groups and school authorities do not allow such classes to be broken up and re-constituted for research purposes (Gall, Borg & Gall, 1996). The schools selected were randomly assigned to the treatment and control conditions as intact groups. The pre-test – post-test approach was used to partially eliminate the initial differences between the experimental and control groups (Gibbon & Herman, 1997). The design is shown in Table 1.

Table 1: Solomon's Four Group Design

Groups	Pre-test	Treatment	Post-test
1	O ₁	X (Problem Solving Approach)	O ₂
2	O ₃	C (Conventional Methods)	O ₄
3		X (Problem Solving Approach)	O ₅
4		C (Conventional methods)	O ₆

Source: Adapted from Gibbon and Herman (1997)

In this design, subjects were assigned randomly to four groups. Groups 1 and 3 received the experimental treatment (X) that was the use of the Problem Solving Approach (PSA) in teaching. Group 1 received a pre-test (O_1) and group 2 received a pre-test (O_3). Groups 2 and 4 constituted the control and use of conventional methods in teaching. Finally all the four groups received post-test (O_2, O_4, O_5 & O_6).

3.2 Target Population

The target population of the current study consisted of all Form Three students from public schools in Vihiga County. The county was chosen for this study because there was no study on the influence of the teaching strategy on students’ mathematics achievement in terms of school type. Form Three students were chosen because the topic Commercial Arithmetic selected for the study is taught at this level (Kenya Institute of Education [KIE], 2002) and that they could express their mathematical ideas in written form (Githua, 2002). The County has 114 schools: 2 national schools, 10 county schools, 97 sub-county schools and 5 private schools. National, county and sub-county schools were selected. There were 109 such schools with a population of 10,555 students.

3.3 Sampling Procedure and Sample Size

The sampling frame consisted of all national, county and sub-county schools in Vihiga County. The first stage was the purposive selection of Vihiga County and the category of school included in the study sample. Purposive sampling was used to select the two national schools that participated in the study. The remaining schools were stratified into boys’ only, girls’ only and co-educational schools. Ten schools were then drawn out of the remaining 107 schools. Because of the smaller number of schools to sample from, balloting method was employed. This involved assigning a numeral to each of the 107 schools, placing the numbers in a container and then picking a number at random without replacement. Schools corresponding to the numbers picked and having at least three streams at the Form Three level were included in the study sample.

According to Mugenda and Mugenda (2003), at least 30 students per group are required for experimental research. Twelve schools were sampled. The twelve classes in the twelve schools were assigned to the four groups in the Solomon four-

group experimental design. Although it was assumed that the average enrolment was forty students per class, giving the approximate sample size of the study as 1440 students, the actual sample size that participated was 1663 students. During data coding, it was found that some students had either incomplete data and/or missed some test. This reduced the sample size for data analysis to 1459 students. These subjects were used in their twelve intact classes in the twelve schools that were assigned to experimental groups 1 and 3, with 367 and 360 students respectively; and control groups 2 and 4, with 344 and 388 students respectively.

3.4 Research Instruments

Mathematics Achievement Test 1 (MAT 1) and Mathematics Achievement Test 2 (MAT 2) were used to collect data to meet the objective of the study. They were developed and pilot tested prior to the actual conduct of the study. MAT 1 was used as a pre-test and had items on the topic Commercial Arithmetic covered at the Form one level. Its purpose was to establish the entry behaviour of the learners before the treatment. MAT 2 was used as a post-test. It was used to assess Form Three students’ achievement in Commercial Arithmetic after the treatment. It was administered after the treatment when all the lessons had been taught. The instruments were pilot tested on 42 Form Three students that did not participate in the study.

3.5 Validity of Instruments

MAT 1 and MAT 2 were assessed for content and face validity. This was done by two experienced secondary school mathematics teachers, the two academic supervisors and two mathematics educators from the Department of Science and Mathematics Education at Masinde Muliro University of Science and Technology. Each panel member assessed the items in MAT 1 and MAT 2 for content coverage and level of difficult. Their responses were measured on a five-point Likert scale. They were scored and transcribed into a percentage score. An average score of above 70% for face and content validity implied that the instrument was appropriate. The averages of the responses of the face and content validity of each of the instruments are as shown in Table 2.

Table 2: Summary of Assessment of Instruments’ Validity by Percentage

Instruments	Type of Validity	Mathematics Teachers	Academic Supervisors	Mathematics Educators	Average Percentage	Conclusion
MAT 1	Face	86	74	78	79.33	Appropriate
	Content	88	85	94	89.00	Appropriate
MAT 2	Face	87	82	86	85.00	Appropriate
	Content	90	88	92	90.00	Appropriate

Source: Researcher’s computations from MATs questionnaires

3.6 Reliability of Instruments

The reliabilities of MAT 1 and MAT 2 were ascertained using test-retest method. The correlation coefficients were ascertained using Cronbach’s Coefficient Alpha method (Gall,

Borg & Gall, 1996). Correlation coefficients of 0.795 and 0.872 were obtained for MAT 1 and MAT 2 respectively. These values of correlation coefficients were considered appropriate to make possible group predictions that are sufficiently accurate.

3.7 Data Collection Procedures

Before the treatment started, the research assistants from participating schools were inducted for a period of two days by the researcher as pertains to the use of the PSA and conventional methods. They trained the students in the experimental groups pertaining to the requirements and use of PSA for a period of three days. The teachers in the experimental groups were issued with instructional manuals specifically developed for the topic Commercial Arithmetic. After the induction period, the research assistants administered a ninety-minute MAT 1 to students in groups 1 and 2. The MAT 1 scripts were collected and scored for three days in each respective school by the researcher and his assistants. The pre-test scores were used to assess the entry level and homogeneity of the students in the randomly assigned experimental and control groups. The researcher and his assistants taught groups 1 and 3 the topic Commercial Arithmetic using PSA for a treatment period of three weeks. Groups 2 and 4 were taught the same topic using conventional methods where learning was mainly teacher-centred.

Two days after the treatment period, the researcher and his assistants administered a ninety-minute MAT 2 to all the four groups at the same time. The researcher with the help of the research assistants scored and coded the collected data. To ensure uniformity in the marking, the MAT 2 scripts were scored using the belting system as currently advocated by the KNEC.

3.8 Data Analysis Techniques

The data obtained in the study constituted of MAT 1 pre-test scores and MAT 2 post-test scores of the experimental and control groups. The descriptive statistical tests that were done comprised of percentages, means and standard deviations. The

inferential statistical tests; the t-test and the Analysis of Variance (ANOVA) were used to analyse data at an alpha level (α) of 0.05. The t-test was used to analyse the pre-test and the post-test influence. It was also used to compare whether students' mean scores were significantly different, based on the pre-test scores of experimental group 1 and control group 2. A comparison of mean scores and tests for significance difference between experimental and control group scores was done using ANOVA. An F-test was used to determine whether the differences were significant.

IV. RESULTS

4.1 Results of Pre-tests

The Solomon Four-Group Design used in this study enabled the researcher to have two groups sit for pre-tests. The aim for pre-testing was to ascertain whether or not the students selected to participate in this study had comparable characteristics before presenting the topic Commercial Arithmetic. To achieve this aim, the students in groups 1 and 2 sat for the pre-test MAT 1. This made it possible for the researcher to: assess whether there was any interaction between the pre-test and the treatment conditions and assess the similarity of the groups before the administration of the treatment (Borg & Gall, 1989).

A total of 711 students were administered with pre-test MAT 1, of which 367 were in group 1 and 344 in group 2. Table 3 shows the t-test of the pre-test scores on the MAT 1.

Table 3: Independent Samples t-test of the Pre-test Scores on MAT 1

Experimental Group 1, N = 367			Control Group 2, N = 344		
Variable	Group	Mean	SD	t-value	P-value
MAT 1	1	37.66 ^a	8.18	0.313*	0.754
	2	37.88 ^a	10.37		

Notes: ^a denotes similar mean scores * Not significant at $p < 0.05$ level
SD: Standard Deviation MAT 1 Maximum Mean Score = 100 df = (1, 709)

From Table 3, the experimental group 1 scored a mean of 37.66 and the control group had a mean of 37.88 in MAT 1. From the results, the pre-test mean scores of both groups (1 & 2) obtained were similar on MAT 1. The t-test results analysis reveal that the pre-test mean scores for groups 1 and 2 on MAT 1 measure are not statistically different since the t-value for MAT 1 (0.313), is not significant at 0.05 α -level, $df = (1, 709)$.

An examination of the results in Table 3 indicate that the pre-test mean scores for experimental group 1 and control group 2 on MAT 1 are not statistically different at 0.05 α -level. From the results presented in Tables 3, it suffices that the pre-test MAT 1 mean scores of students in the experimental group 1 and the control group 2 are not statistically different at 0.05 α -level. This indicates that the four groups used in the study were comparable and had similar entry behaviour, hence homogeneous. This made them suitable for the study.

4.2 Influence of PSA on Students' Achievement in Commercial Arithmetic by School type

The post-test MAT 2 scores were analysed to determine the influence of PSA on students' achievement in national schools in comparison to those in county and sub-county schools using one-way ANOVA. This was done in order to test hypothesis one (H_{O1}) that sought to determine whether there was any difference in achievement of students taught using PSA based on school type. Table 4 shows the post-test MAT 2 mean scores obtained by the students in the three types of schools.

Table 4: MAT 2 Post-test Mean Scores obtained by Students based on School type

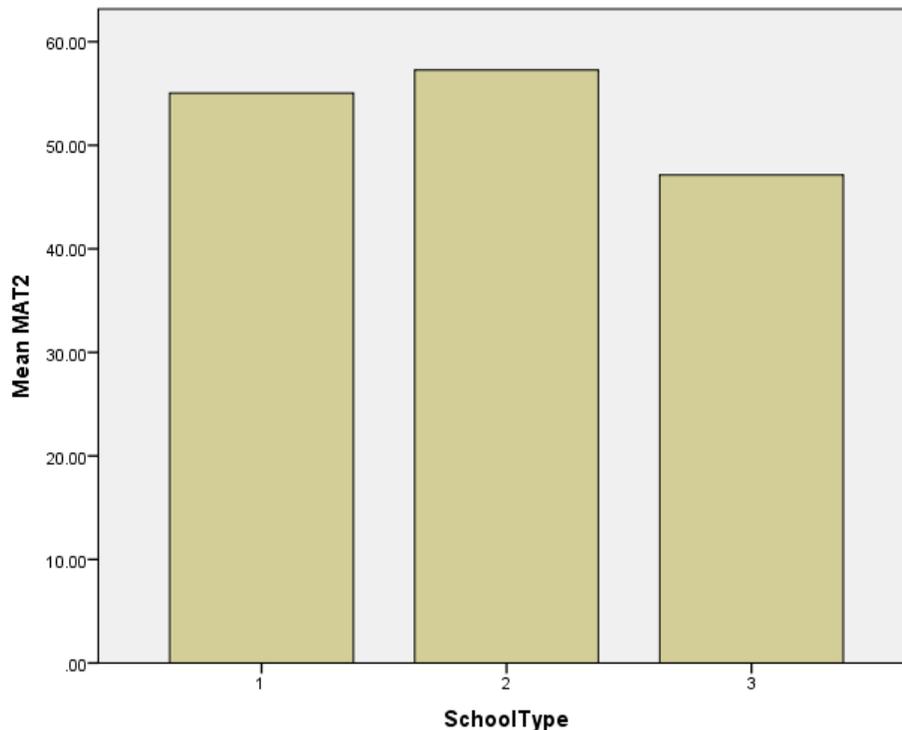
School type	N	Mean Score	SD
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1 (National)	272	55.04	8.61
2 (County)	223	57.26	7.65
3 (Sub-county)	232	47.12	9.85
Total	727	53.20	9.72

of the results show that the highest mean score (57.26) was attained by the students in school type 2 (county schools) followed by (55.04) for the students in school type 1 (national schools) and finally by (47.12) for the students in school type 3 (sub-county schools). The MAT 2 post-test mean score for the students in the county schools is higher than that of their counterparts in the national and the sub-county schools in the two experimental groups 1 and 3. This indicated that the students in the county schools performed better than the students in the national and sub-county schools when taught using PSA. The mean scores are presented graphically in Figure 1.

Note: Maximum Mean Score = 100

From Table 4, a total of 727 students in the experimental groups 1 and 3 participated in the study. Of these, 272 students were from national schools, 223 students from the county schools and 232 students from the sub-county schools. An examination



Notes: 1: National Schools 2: County Schools 3: Sub-county Schools

Figure 1: Post-test means on MAT 2 by School type

In order to determine whether the difference in the MAT 2 post-test mean scores among the three types of schools was

significant, a one-way ANOVA was performed. The results of the one-way ANOVA are shown in Table 5.

Table 5: ANOVA of the Post-test Scores on the MAT 2 based on School type

Source of Variation	Sum of Squares	df	Mean Square	F	P-Value
Between Groups	13143.60	2	6571.80	85.76*	0.00
Within Groups	55478.67	724	76.63		
Total	68622.26	726			

* Denotes significant mean difference at the p<0.05 level

An examination of the results in Table 5 shows that the difference in the post-test MAT 2 mean scores is significant, the F-value (85.76) from ANOVA is significant at p<0.05 α -level, df

df=(2, 724) = (2, 724). Having established that there was a significant difference between the MAT 2 post-test mean scores, it was necessary to carry out further tests on the various combinations of the mean scores to find out where the difference occurred.

Table 6 shows the result of the Least Significance Difference (LSD) post hoc comparisons.

Table 6: Post Hoc Comparisons of the Post-test MAT 2 Means based on School type

	(I) Group	(J) Group	Mean Difference (I-J)	P-Value
LSD	1	2	-2.22*	0.005
		3	7.90*	0.000
	2	1	2.22*	0.005
		3	-10.13*	0.000
	3	1	-7.90*	0.000
		2	-10.13*	0.000

Notes: * = The mean difference is significant at the 0.05 level (2-tailed test)

1: National Schools

2: County Schools

3: Sub-county Schools

The LSD post hoc comparisons indicate significant differences ($p < 0.05$) between groups 1 and 2, 1 and 3 and 2 and 3. Therefore the differences between the MAT 2 post-test mean scores of the three types of schools are significant at $p < 0.05$ α -level (Table 6). Since the MAT 1 pre-test mean scores indicated that there was no significant differences between the entry levels of the groups involved in the study, then it was not necessary to confirm the post-test results by performing Analysis of Covariance (ANCOVA).

The results showed that the mean difference between the school type 1 and 2 (i.e. national & county schools) was significant in favour of the county schools. The mean difference between the school type 1 and 3 (i.e. national & sub-county schools) was significant in favour of the national schools while the mean difference between the school type 2 and 3 (i.e. county & sub-county schools) was significant in favour of the county schools. The net differences in the mean gains between the national and county, the county and sub-county and the national and sub-county schools are 2.22, 10.13 and 7.92 respectively. Overall the results showed that the students in the county schools attained significantly higher achievement in MAT 2 in comparison to those in the national and sub-county schools. This implies that PSA as a teaching strategy had a significantly higher influence on achievement among the students in the county schools. Therefore, the null hypothesis H_{01} indicating that there is no statistically significant difference in the achievement of students taught using PSA in national schools as compared to those in the county and sub-county schools is rejected.

V. DISCUSSION

5.1 Results of the Pre-tests

This study employed the Solomon Four-Group Design. The students were put in four groups such that groups 1 and 3 were the experimental groups while groups 2 and 4 were the control groups. Groups 1 and 2 took the pre-test while groups 3 and 4 did not take the pre-test. Such an arrangement enabled the researcher to determine the presence of any interaction between pre-test and the PSA treatment as well as determine the similarity of the groups before applying the treatment and generalise to the groups which had not received the pre-test (Sharma, 2002).

Sanders and Pinhey (1979) assert that when the two experimental groups (1 & 3) are similar to each other in the post-test as opposed to the two control groups (2 & 4), then the researcher is in a strong position to attribute the differences to the experimental condition. The post-test students' mathematics achievement result in this study did not indicate any interaction between the pre-test and the PSA treatment.

Higher post-test performance by groups 1 and 2 than that of groups 3 and 4 could have been the results if the pre-test provided a practice effect. This is not the case since a comparison of the post-test results of the four groups fails to indicate any practice effect provided by the pre-tests. The results therefore portrayed that the pre-test MAT 1 was suitable for the study.

A comparison of groups 1 and 2 students' pre-test MAT 1 mean scores revealed non-significant differences (Table 3). This results show that the groups were quite similar before the administration of the treatment.

5.2 Influence of Problem Solving Approach on Students' Achievement in Commercial Arithmetic by School type

The results of this study reveal that students who were taught Commercial Arithmetic using PSA in county schools achieved higher mean score in the MAT 2 than those in the national and the sub-county schools (Table 4). This implies that

the use of PSA is more effective in improving students' achievement in county schools as compared to those in the national and sub-county schools.

The findings of this study showed that PSA is more beneficial to students in the county schools. This is probably because those students in national schools might be having their own successful strategies, which they may fail to employ when they use PSA and thus get disadvantaged in the process. Studies have shown that using PSA is a difficult process. Students need a lot of training to master its use if they are to derive any benefits from it (Tick, 2007). Thus, it is possible that conformity of students (in county schools) to teachers' demands as well as their consistency in the use of PSA, enabled them master the new techniques as opposed to those in the national schools who are probably predisposed to employ alternative learning strategies. Students in the sub-county schools are in most cases hapless when learning mathematics. This is probably because of poor learning strategies they employ. Thus the use of PSA as a teaching strategy in this study explains the improved achievement among the students in the county schools.

Herreid (2003) notes that students' achievement might be negatively affected by the teachers' approach in presenting the subject matter. Consequently, the teachers' role in the lesson is a major determining factor of the classroom environment. Meaningful learning often develops best in classroom environments that give students more opportunities for more participatory interaction (Cooper & Robinson, 2002; Chin & Chia, 2004). It seems likely that this is the reason why the teacher in the PSA treatment groups provided more student participation opportunities. This is in line with Yuzhi (2003) and Wasike (2003) who found a strong relationship between the nature of the conducive classroom environment and the acquisition of the necessary knowledge, concepts and skills in sciences and mathematics. The PSA resulted in a conducive classroom environment. The teacher was responsible for restructuring and controlling the mathematics' classroom environment in order to allow the students to work interactively in collaborative groups. This led to improved students' achievement in the three categories of schools and especially in the county schools.

The low performance of students in the sub-county schools as compared to those in the national and county schools were unexpected bearing in mind that effective instructional methods that encompasses students' participation in learning are expected to improve on cognitive characteristics of learners compared to the conventional teaching methods (Barchok, 2012). One possible explanation for this perceived contradiction is probably the short period that the intervention took (3 weeks) in the present study. Significant improvement on students' mathematics achievement in the sub-county schools was unlikely to be effected over such a short period of time considering the fact that this is a cognitive characteristic which requires reasonable period of time for the knowledge gained to be discriminated, assimilated and accommodated into the learners' old structures of knowledge before its application. In addition, the achievement measured was directed towards learning in Commercial Arithmetic as a topic and therefore was unlikely to be determined solely by teaching of the one particular topic as was done in the present study.

Though there were positive results from the use of PSA in the sub-county schools, it was apparent that both teachers and students faced some challenges. Ngeow and Kong (2001) alluded that as the PSA requires students to adopt active learning strategies and become more self-directed in their learning, some students faced difficulties in adapting into critical thinkers. According to Wood (2003), the use of the PSA requires a greater number of staff to be involved in teaching and essentially more staff development particularly focusing on facilitation and management of group dynamics (i.e. dependence on other members and inconformity within groups). Goodnough (2003) points out that the use of PSA with large groups is hard due to the difficult in ensuring that groups functioned successfully. Due to time constraints, information is not always properly shared or fully discussed. There can be resentment because some group members take on more responsibility than others. Some students indicate discomfort with the process that there is not enough direction, they request more feedback on the success of their efforts or are uncertain if they have covered all the relevant areas (Boud & Feletti, 1997). However, this study has shown that PSA results in improved students' achievement in mathematics in the three types of schools. In view of this, it suffices to point that the PSA should be adopted for mathematics instruction in Kenyan secondary schools.

The findings of this study have some practical implications to mathematics education. PSA engages students in constructing and altering their own knowledge structures leading to better understanding of mathematics concepts and skills. However, in this study PSA as a teaching strategy was found to be more beneficial to students, particularly in county and national schools by improving on their achievement in mathematics. There is need however to scrutinize the learning strategies of students in sub-county schools in order to identify ways in which the benefits of PSA as a teaching/learning strategy can be harnessed to benefit them too. Consequently there is need for longer training sessions in the use of PSA and direct feedback to give students in the sub-county schools the opportunity to benefit from its use.

The findings of this study also showed that PSA as a teaching strategy has a positive and significant contribution to understanding of mathematics concepts and skills among students in the county and national schools. This is not the case however with the students in the sub-county schools. This implies that in choosing a method of instruction, it is imperative that mathematics teachers consider the uniqueness of each student in terms of academic abilities when handling them. This is particularly necessary to avoid disadvantaging students particularly in the teaching/learning strategies employed in classroom interactions. PSA as a teaching strategy is more beneficial to students in the county and national schools because they are more conforming and consistent in its use within a short time span. Students in the sub-county schools on the other hand might be having other strategies that they consider more successful to themselves. However, the intervention period for this study was notably shorter (three weeks). This factor may probably help explain the low achievement gains among the students in the sub-county schools. A long intervention period might allow ample time for significant gains in the achievement of students in the sub-county schools.

VI. CONCLUSIONS

The following conclusions have been drawn from the analysis of the data presented:

- a) PSA has influence on students' mathematics achievement in the national, county and sub-county schools. The PSA positively influenced the students' mathematics achievement in the three types of schools that resulted in their autonomous learning and subsequent ownership of the lessons. Thus, the PSA facilitates students' learning in mathematics.
- b) Students in the county schools who are taught using the PSA will learn and achieve significantly better results in mathematics than those in the national and sub-county schools.

VII. RECOMMENDATIONS

On the basis of the findings of this study, the researcher made recommendations that the mathematics educators as well as education stakeholders can employ PSA to enhance effective and efficient mathematics classroom discourse between the teachers and the students. These recommendations are: -

- (i) PSA as a teaching strategy has beneficial influence on the achievement of secondary school mathematics students. Secondary school mathematics teachers in Vihiga County should therefore enhance the use of the PSA teaching strategy to address the perennial problem of underachievement, especially among the students.
- (ii) PSA has beneficial influence on the understanding among mathematics students in national, county and sub-county schools. Teachers should therefore enhance the use of the PSA teaching strategy to promote meaningful learning among this group of students and especially to those in the sub-county schools.
- (iii) The PSA had a positive influence on the students' achievement, especially to those in the county schools, in comparison to those taught by conventional teaching methods. This implies that the problem of low achievement among students in the sub-county schools may be addressed by incorporating the PSA in the teaching at the sub-county secondary school level.

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Adaptive Noise Cancellation For Speech Signal

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DOI: 10.29322/IJSRP.10.09.2020.p10516

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10516>

Abstract- In speech communication systems, obtaining desired signal from dialogue signal that is polluted by noise, using digital filter noise minimization is a widely known technique. This is accomplished by adaptive filter algorithms, in detail, this project focused on LMS and NLMS Algorithms. The purpose of adaptive noise drop is to get an estimation of the signal of noise and to deduct it from the noisy signal and hence upgrade the quality of the signal.

For this purpose, the filter utilizes a flexible algorithm to alter the worth of the filter coefficients, so that it obtains a good estimate of the signal after each repetitions. The performance of the system is evaluated by the impacts of different factors such as: - number of samples, amount of filter coefficients, step size, and input noise level. Finally, the performances of the algorithms in different cases is verified by simulating noise reduction ratio (NRR) by MATLAB platform.

Index Terms- Adaptive systems, Adaptive Noise Canceller, LMS, NLMS ,NRR

I. INTRODUCTION

In speech (voice) communication systems the desired signals are mixed with additive noise signals. To filter out the desired speech signal from signal corrupted by noise signal using adaptive digital filtering. The process of Extracting desired signals by this method is known as Adaptive Noise Cancellation (ANC). Noise is a public nuisance. It has an adverse psychological effect on living beings. Noise causes mental strain or tiredness, thus creating an inefficient working environment; continued noise coverage makes temporary or permanent loss of hearing.

Acoustic difficulties in the environment are gaining consideration because of the marvelous growth of technology that has led to noisy engines, heavy machinery, pumps, high speed wind buffering and a many other noise sources. Experiencing to high levels of sound causes damage to human from the physical and psychological aspects. Noise pollution is another great contributor to the environmental hazards that the world is encountering these days. Together with having a negative impact on the environment, extreme noise can cause health difficulties

The problem of controlling the level of noise in the environment has been the focus of tremendous amount of research over the years. Statutory legislations are being enforced on industries to make them strictly follow the ceiling on the maximum noise level. However, as long as the quest for larger and more powerful machinery continues, the noise pollution level will be on the rise. Due to these reasons, noise control has gained considerable importance in recent years. Acoustic Noise Control conventionally includes passive methods such as enclosures, barriers and silencers to weaken noise. These methods use either the idea of impedance change or the energy loss due to sound captivating materials.

These approaches are though not operative for low frequency noise. A technique to overwhelm this tricky is Active Noise Cancellation (ANC), which is sound field alteration using electro acoustic means. Many researchers have proposed different definitions of noise as a result of its broad category of existence. In general, the most common definition states- "Noise is arbitrary, unwanted electrical energy that enters the communications system through the communicating medium and obstructs with the conveyed message.

However, some unwanted signal is also generated in the receiver." Before initiating the study on noise reduction, it is recommended to overview noise as the starting point. Noise can be simply stated that disturbance in the signal due to unwanted signal. The signal from any source that interfere the signal under consideration is termed as noise signal. Some common example of noise signals are the sound from mechanical devices, biological creatures, natural phenomenon (lightening, thunderstorm etc.). The noise from the surrounding mixes with the signal and disorients its information. This effect does not need noise signal to be noisy enough to be recognized by human ears. Ultrasound noise, radio waves (for example) too interferes with signal.

In contrast with human intelligence machines cannot simply deduce noise and eliminate it. The noise prevention methods cannot be very effective since, two signals of different phase for two different receivers are noise for each other. In another words, the activity for one system produce signals that are noise for another system. Some examples of noise from day to day activities .The effect of noise

cannot be explained as the magnitude of noise is responsible for it. In this scenario, the study of noise elimination techniques becomes a crucial share of modern signal processing systems.

II. TRADITIONAL FILTERING TECHNIQUES

In communication system, commonly different transformational operations are taken place on signal during information transmission. The figures of noise corrupting signal is unknown in many conditions and varies with time. Additionally, the power of noise may be stronger relative to power of desired signal being transmitted. The unwanted signal reduction using adaptive filter is a familiar method for obtaining the desired voice signal mixed with noise

Extracting the voice signal of interest from the noise-corrupted signal is significant signal processing task in speech communication systems. In noise cancellation, signal processing operations contain to filtering out the unwanted noise or any intervention from the signal contaminated by noise so that the desired signal can be well again. In such circumstances, adaptive digital filters can express better-quality performance in cancelling background noise as related with conventional non-adaptive filters. Noise reduction is the technique of extracting noise from a signal susceptible to disturbance. Noise can be accidental or white noise with a frequency distribution, or frequency reliant on noise presented by a device's mechanism or signal processing algorithms. In electronic devices, a main kind of noise is hiss formed by random electron motion because of thermal anxiety at all temperatures above absolute zero. These disturbed electrons quickly add and subtract from the voltage of the output signal and therefore produce noticeable noise. The known technique used to estimate the signals corrupted by noise is to pass it through the system that have a tendency to overturn the noise while leaving the signals unchanged. This type of signal estimation is known as direct filtering. The design of such filter was originated by wiener and increasingly changing to be emerged as the most important techniques in the area by the likes of Kalman and others in the domain of optimal filtering.



Figure 2. 1.Fundamental filtering system

Filters which are accessible for direct extracting can be fixed filter. Fixed filters: Are filters which needs previous information of both signal and noise. Which implies that if we identify properties of the signal and noise beforehand filtering, we implement the system that permits frequency that contains the wanted signal and block the frequency band taken by noise signal. This type filters are working under stationary conditions.

Adaptive filter: The filters which are categorized under adaptive filters are the ability to adjust the impulse response of a signal in order to know the statistics of the signals like mean, variance and so on by adjusting the weight of the filter and estimating the error. This kind of system has no knowledge of the statistics of the signals beforehand or no previous information of the input signals. They have a capability of adaptively tracking the signals under non-stationary conditions.

2.1 Some Common Types of Filtering Techniques:

2.1.1 Butterworth Filter

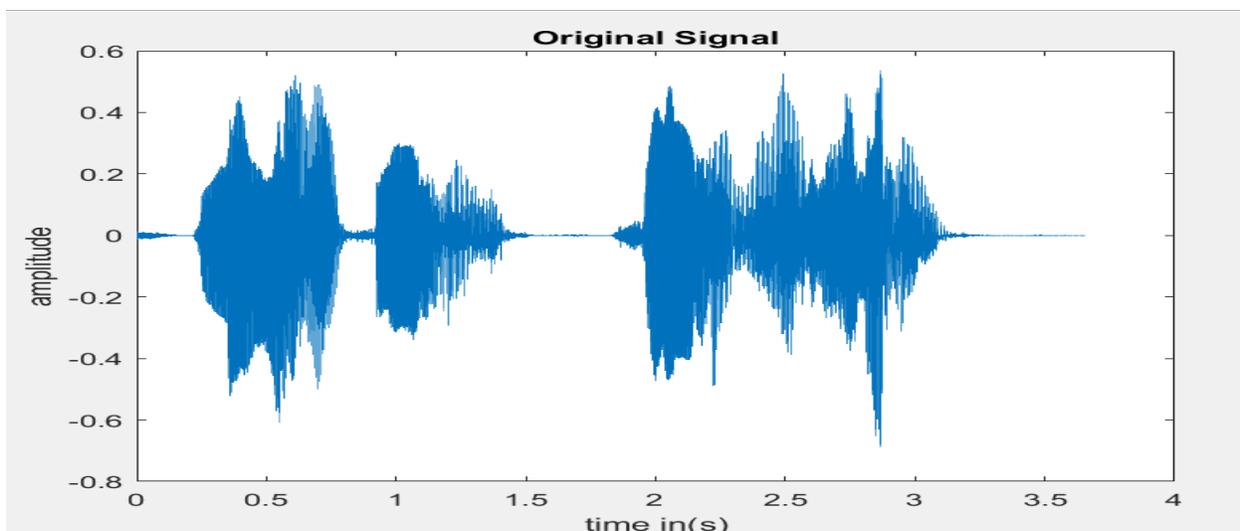


Figure 2. 2. Original speech signal

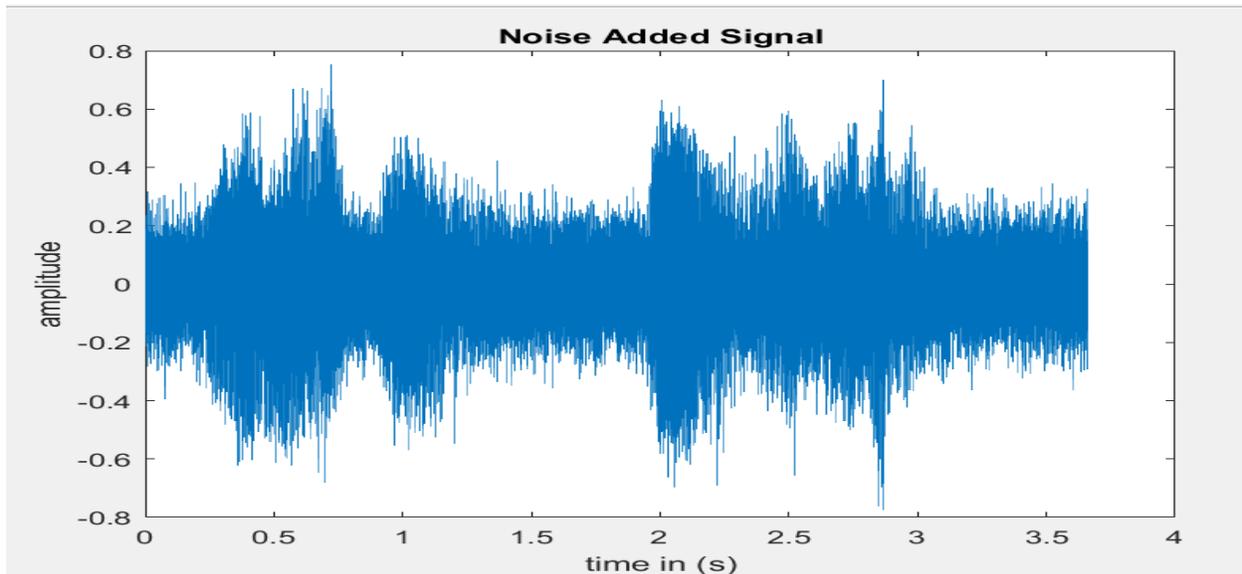


Figure 2. 3. Mixed signal

Butterworth Filter this system is a category of signal processing system implemented to have a frequency response as smooth as likely as in the pass band. It is also denoted as an extremely flat magnitude filter.

Butterworth Filter was first invented in 1930 by the British engineer. Butterworth had a standing for answering "impossible" mathematical complications. By the time, system design required for as considerable amount of designer experience because of the limitations of the theory then in use. The system was not in shared use for many years afterward its publication. The system identified that: "An ideal electrical system should not only totally block the unwelcome frequencies but should also have similar sensitivity for the wanted frequencies".

Such an ideal filter cannot be attained but Butterworth exhibited that successively closer estimates were obtained with increasing numbers of filter elements of the right values. At the time, systems generated considerable ripple in the pass band, and the high-quality of component values was highly communicating. This system showed that a low pass filter might be implemented and the frequency at which transition start is normalized to 1 and given by an equation as follows.

$$G(\omega) = \frac{1}{\sqrt{1 + \omega^{2n}}} \quad 2.1$$

Where ω is given by in standard unit of frequency response and n is the number of poles to the respective number of responsive elements in the system. If $\omega = 1$, the magnitude response of this system is in the pass band is $1/\sqrt{2} \approx 0.707$, which is half of the given power. This system is only dealt with filters with an even number of poles in proposed paper. The inventor might have been uninformed that such systems could be designed with an odd amount of poles. The engineer discovered his large order systems from 2-pole systems isolated by specific type of amplifier.

The view of frequency response of all pole systems is described as A, B, C, D, and E in his main graph. This type of system is solved the equations for two- and four-pole filters, showing how the latter could be cascaded when separated by vacuum tube and so allowing the structure of large order filters in spite of inductor losses. In 1930, best materials, that means, materials that have minimum core lose such as molypermalloy had not been exposed and vacuum-cored voice inductors stood slightly glossy.

He revealed that it was possible to modify the constituent values of the system to replace for the winding resistance of the inductors. He used coil forms of 1.25" Diameter and 3" Length with plug-in terminals. Connected passive elements were confined inside the wound coil form. The coil molded part of the plate load resistor. Two poles were used per vacuum tube and passive element coupling was used to the network. The inventor also has showed that the fundamental low-pass system could be adapted to give all ranges bands service.

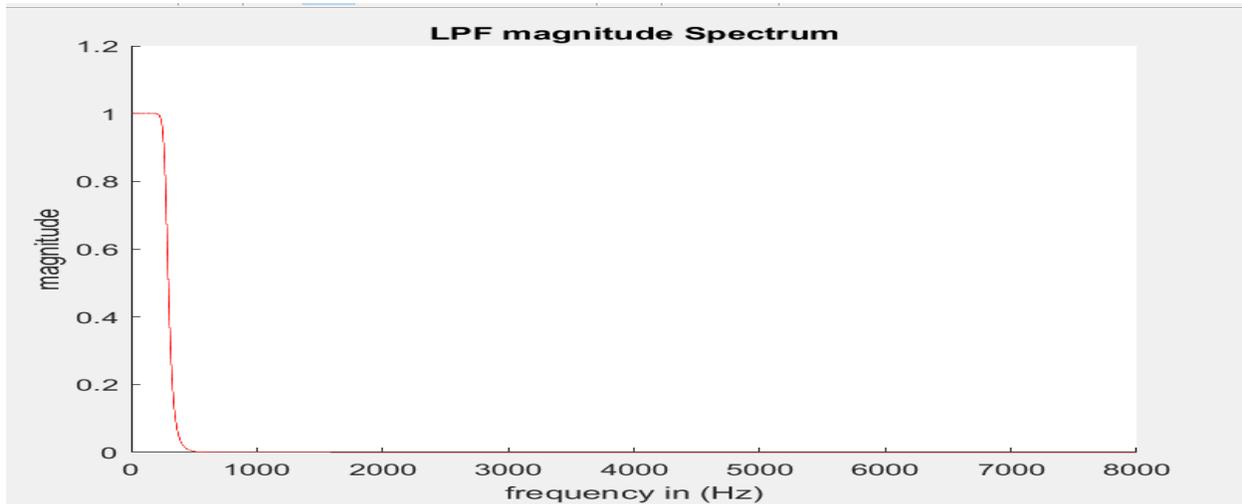


Figure.2. 4. Low Pass Filter

This filter is implemented to filter out or extract the noise part of the signal from contaminated signal adaptively as per the algorithm. The cutoff frequency (f_c) where the output load voltage is equal to 0.707 of the input source, which shows the range of frequency in which our spectrum of the signal is strongly concentrated, of this designed filter is 0.035. All signals out of this range is eliminated and the signals with in this range is recovered perfectly. In many applications we want to attenuate the part of which have high frequency of signals is done by low pass filters which passes frequency below cutoff frequency and attenuates the frequency above it .So, the signal range above the turning point is one of high frequency parts which need to be eliminated, accordingly the noisy signal is processed and recovered in this thesis.

2.1.2 Chebyshev filters

Chebyshev filters this system are any type of devices having a high pitched roll-off and added pass band fluctuation (type I) or stop band fluctuation(type II) when we related to previous one . And it have the property that they minimize the error between the idealized and the true filter characteristic for the given width of the system (See references e.g. [Daniels], [Lutovac]), but with fluctuations of pass band. This type of system is comes after Pafnuty Chebyshev as its exact features are resulting from its equations. The type I systems are known frequently as just "Chebyshev filters", the type II ones are typically known as “counter Chebyshev system”. Since the pass band fluctuation characteristics in Chebyshev filters, the ones that have a flatter response in the pass band but a more uneven response in the stop band are favored for some applications. Type I system is the famous types of this filters.

The gain response, $G_n(\omega)$ as a relation of angular frequency ω of the given level of low-pass system is equivalent to the magnitude value of its ratio of output to input.

$$G_n(\omega) = |H_n(j\omega)| = \frac{1}{\sqrt{1 + \epsilon^2 T_n^2\left(\frac{\omega}{\omega_0}\right)}} \quad 2.2$$

is calculated at $s=j\omega$ where ϵ is the ripple factor, ω_0 is the cutoff frequency and T_n is a Chebyshev polynomial of the n^{th} order. The pass band exhibits equi ripple behavior, with the ripple determined by the ripple factor. In the pass band, the Chebyshev polynomial alternates between -1 and 1 so the filter gain alternate between maxima at $G = 1$ and minima at ,

$$G_n(\omega) = \frac{1}{\sqrt{1 + \epsilon^2}} \quad 2.3$$

The ripple factor ϵ is thus related to the pass band ripple δ in decibels by:

$$\epsilon = \sqrt{10^{0.1\delta} - 1} \quad 2.4$$

At the center frequency ω_0 the transfer function has the value but keeping decrease to down in to the stop band as the frequency is getting large. The collective use of defining the center frequency at basic is typically not used to Chebyshev systems; rather the center frequency is taken as the value at which the system transfer function down to the value of the ripple for the last phase.

2.1.3 Elliptical filter

An elliptic filter (also known as a Causer filter, named after Wilhelm Causer, or as a Zolotarev filter, after Yegor Zolotarev) is a signal processing filter with equalized ripple (equiripple) behavior in both the pass band and stop band. The values of fluctuations in

each range of band is separately maintained, and no other system of the same level can have a higher change in result among the bands, for the given values of fluctuations (whether the it is equivalent or not). In other way, one may take over the ability to maintain separately the pass band and stop band variations, and in place of implement a system that is highly exposed to component variations. When the variations in the stop band limits to zero, the system gives type I Chebyshev system. While as the variations in the pass band limits to zero, the system becomes a type II Chebyshev system and at the end, as both variations values limits to zero, the system becomes a Butterworth system.

The relationship between elliptic filter with that of angular frequency in low pass band is given by:

$$G_n(\omega) = \frac{1}{\sqrt{1 + \epsilon^2 R^2 \left(\xi \frac{\omega}{\omega_o} \right)}} \quad 2.5$$

Given that R_n is the given order of elliptic rational function (sometimes known as a Chebyshev rational function) and ω_o is the center frequency ϵ is the fluctuation parameter and ξ is the choosiness parameter.

The value of the first parameter identifies pass band fluctuation, while the two factors specify stop band ripple.

III. ADAPTIVE SYSTEMS

Adaptive system is the modern area of research in current years, it is the systems which have time varying and self-updating performance. This type of system has shown the characteristics of listed below: They can automatically adapt or self-optimize in the face changing (non-stationary) environments and changing system requirements. They can be trained to perform specific filtering and decision-making tasks. The creation of systems having these ability can be automatically implemented through training. In a logic of adaptive system can be adjusted by a repeating process.

This type of systems does not elaborate synthesis procedures usually needed for no adaptive systems. Instead, they tend to be self-designing.

They can infer a model of behavior to work with new circumstances after having seen adapted on a finite and often with minimum times of training signals or configurations.

In a limited amount, the adaptive systems can maintain themselves; means that, they can learn around an issues of internal problems. Sometimes the system can usually be defined as nonlinear systems with time-variant factors.

Its kwon that, the systems reflecting behavior like this is difficult and very complex to analyze relative with no adaptive systems however, they provide better performance when the input signal characteristics are undefined or time-variant.

And adaptive filter is a device with a linear system that has a gain managed by variable factors and a means to adapt those factors as per adaptive algorithms. Nearly, all adaptive systems are digital filters since optimization algorithms are very complex in implementation. This types of filters are important in the applications of the desired parameters in the processing operation which are not known priori or are changing like: the locations of reflective surfaces in a reverberant space. The way system uses previous result with that of current input feedback in the form of an error signal to refine its gain.

As whole, the closed loop system involves the use of a cost function, which is a standard for finest performance of the filter, to feed an algorithm, which controls how to adapt filter transfer function to minimalize the cost on the iterations

The sum of mean square of the error (MMSE), is the most famous cost function in digital signal processing applications.

As the power of digital signal processors has growing, adaptive systems have become much more familiar and are now regularly applicable in devices such as mobile phones and other communication devices, camcorders and digital cameras, and medical monitoring equipment.

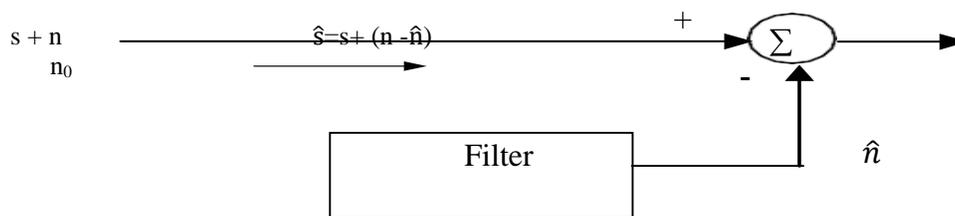


Figure 3. 1. Basics of noise estimation

Noise minimization is a deviation of the best filtering that includes creating an estimate of the noise by extracting the reference input and then deducting this noise estimate from the primary input comprising both signal and noise, simply, noisy signals subtracting noise from a received signal involves the problem of misrepresenting the signal and if done inappropriately, it may lead to an increase in the noise level. This requires that the noise estimate should be an exact duplication of n. If it were likely to know the relationship between n and \hat{n} , or the features of the networks conveying noise from the noise source to the noisy signal and noise inputs are known, it would be promising to make \hat{n} a close estimate of n by generating a stationary filter, thought, since the behavior of the transmission

medium are not known and are random, filtering and subtraction are managed by an adaptive algorithms. Hence the self-adjusting filter is used that is capable of adjusting its parameters to minimize an error signal, which is dependent on the filter output. The updating of the filter weights, and hence the impulse response, is controlled by an adaptive algorithm. With adaptive control, noise cancellation can be adaptively done with nearly out of contaminating the signal. In fact, Adaptive Noise Cancelling is the device that makes possible accomplishment of noise elimination levels that are not possible to attain by direct filtering. The error signal to be used depends on application used.

3.1. Principles of Adaptive Noise Cancellation

General model which represent the entire analysis of this thesis is depicted below by block diagram. Each points like inputs, outputs and blocks have its features. Figure 2 3 shows the details.

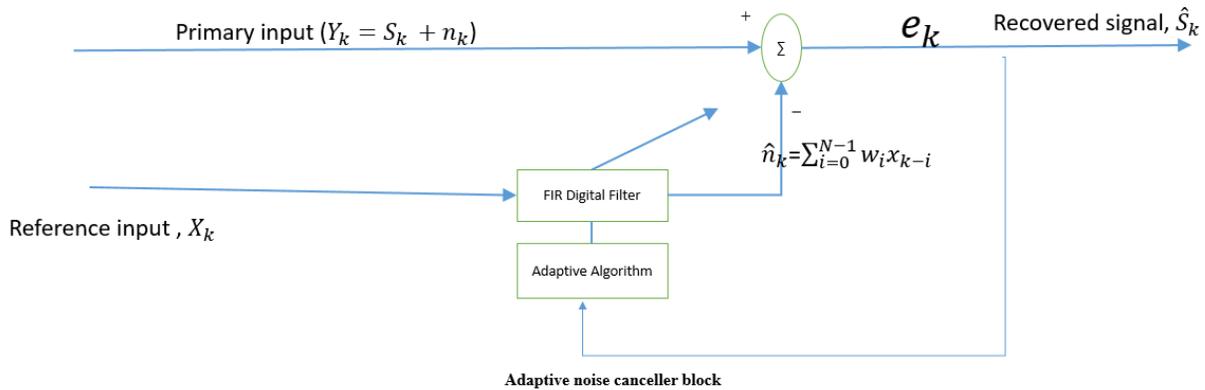


Figure 3. 2. Model of Adaptive Noise Cancellation

From the above figure the system has two inputs; *the noisy signal (primary)* and the noise signal (*reference*). The primary which is the input receives a signal S_k from the signal source that is despoiled by the occurrence of noise n_k non similar with the wanted signal. The reference input retrieves unwanted signal X_k that is not similar with the signal S_k but in other direction with the noise n_k . The noise X_k goes through adaptive filter to produce an output \hat{n}_k that is a very approximate of noise in contaminated signal (primary).

This noise approximate is minimized from the despoiled signal to produce the replica of the signal at \hat{S}_k of the system output. In noise minimization systems a tangible objective is to get a system output $\hat{S}_k = S_k + n_k - \hat{n}_k$ which is the suitable in the optimal logic to the desired signal S_k . This objective is done by giving back the system output to the adaptive filter and updating the filter coefficients via LMS adaptive algorithm and NLMS adaptive algorithms to decrease the total system output power. Again, the system output work for as the in accuracy of the adaptive self-adjusting process.

Let , S_k , X_k , \hat{n}_k and n_k are statistically stationary and have zero means. The signal S_k is uncorrelated with \hat{n}_k and n_k is correlated with \hat{n}_k .

Mathematically, it's shown as follows

$$\hat{S}_K = S_K + n_K - \hat{n}_K \tag{3.1}$$

By squaring both sides of the equations,

$$(\hat{S}_K = S_K + n_K - \hat{n}_K)^2 \tag{3.2}$$

$$\hat{S}_K^2 = S_K^2 + (n_K - \hat{n}_K)^2 - 2\hat{S}_K(n_K - \hat{n}_K) \tag{3.3}$$

By taking the expectation of both sides,

$$E[\hat{S}_K^2] = [S_K^2] + E[(n_K - \hat{n}_K)^2] - 2E[\hat{S}_K(n_K - \hat{n}_K)] \tag{3.4}$$

$$\min E[\hat{S}_K^2] = [S_K^2] + \min E[(n_K - \hat{n}_K)^2] \tag{3.5}$$

Signal power $E[S_K^2]$ will be unaffected as the filter is adjusted to minimize $E[\hat{S}_K^2]$, the output noise power $E[(n_k - \hat{n}_k)^2]$ is also minimized. Since the signal in the output remains uniform, reducing total output power, increases the signal to noise ratio (SNR) of the system.

So,

$$\hat{S}_K - S_K = n_K - \hat{n}_K \tag{3.6}$$

This equivalent is resulting the output \hat{S}_k the best least square estimate of signal input S_k .

3.2. Algorithms

An adaptive algorithm is an algorithm that alters its features at the execution time depend on availability of information and based on previous obtained method (or criterion). This type of message is currently received data information on the available resources or execution time gained information which has relationship with that of the vicinity where it works. The famous algorithm of adaptive systems which is simple that denotes a group of stochastic gradient-descent algorithms which works in self-adjusting filter and machine learning is LMS algorithm least mean square is applicable to approximate the desired signal of the error signal by repeatedly calculating the difference of filter output and noisy signal.

3.3.1 Least Mean Square Algorithm (LMS)

Least mean square algorithm is a technique to approximate gradient vector with instantaneous point .It alters the system tap weight resulting error $e(n)$ is reduced in the mean square logic. The predictable LMS algorithm is a stochastic operation of steepest decent algorithm. It is simply working by adjusting filter coefficients by calculating system output, desired signal and error signals. In this group of algorithm the filter is only adapted according to recent error. Stochastic gradient descent (often abbreviated SGD) is a repetitive method for enhancing (best estimate) an objective function with appropriate smoothness properties (e.g. differentiable or sub differentiable). It is called stochastic since the technique uses randomly choosing input samples to analyses the gradients, as result the gradient is called known as stochastic approximation of gradient descent. Computationally repetitive technique is a procedure that uses an initial estimation to produce a sequence of

$$e(n) = d(n) - W(n)X(n) \quad 3.7$$

$$\hat{n}_k = W^T(n)X(n) \quad 3.8$$

$$\xi(n) = E[e^2(n)] \quad 3.9$$

The coefficient updating equation is,

$$W(n + 1) = W(n) + \mu e(n)X(n) \quad 3.10$$

Where, μ is an appropriate step size, the larger step size make the coefficients to fluctuate in uncontrolled manner and at the end become unstable. Step-size is one of important parameters for LMS algorithm or other adaptive gradient descend algorithms. If the value of step-size is fulfilled the appropriate condition which depends on the quality of recovered signal at that point, then the system will be stable. Though, under environments of having different noise, step-size may set as very small to safeguard the algorithm stable. In addition, typical LMS algorithm may not work properly in special environment, such as spontaneous noise. Hence, the only considering the parameter may not good choice to solve above difficulties.

The step size maintains the balance of the speed of adaptation and the noise in steady state. When the algorithm is in steady state it is likely to notice and decrease step size this will decrease the steady state noise.

3.3.2 Normalized least square algorithm (NLMS)

Adjusts the coefficients of $W(n)$ of a filter in order to reduce the mean square error between the desired signal and output of the filter. Algorithm use the gradient vector of the filter tap weights.

$$W(n + 1) = W(n) + \mu(n)e(n)X(n) \quad 3.11$$

$$\mu(n) = \frac{\beta}{C + \|X_n\|^2} \quad 3.12$$

Where, $\mu(n)$ =normalized step size

β = scaling factor

C = small positive constant

Weight vector:

$$W(n + 1) = W(n) + \frac{\beta}{C + \|X_n\|^2} \quad 3.13$$

In real scenario, input signal power not remain constant. This results changes the step- size between two consecutive coefficients of the filter which will also affect rate of convergence.

IV. SIMULATION RESULTS AND ANALYSIS

The performance estimation of adaptive noise minimization using Least Mean Square (LMS) and Normalized Least Mean Square (NLMS) algorithms are explained in detail. The performance is studied with changing some factors includes: step size, number of filter coefficients, input noise level and number of samples. The noisy signal (speech signal with random noise) is given as input to system and the adaptive noise cancellor adjusting the filter parameters to estimate the noise which is correlated to the noise corrupting signal given through primary input to the system. Finally, the output of adaptive noise cancellor is subtracted from primary output giving the signal almost equivalent to the input desired signal (recovered signal). All the outcomes are found by Mat lab simulations. The speech

signal have the following features or properties. Those properties are number of sample, bitrate, audio sample size, audio sampling rate, audio format, and speech recording duration.

Number of samples	24000
Bit rate	64kbps
Audio sampling size	8 bit
Audio sampling rate	8000 Hz
Audio format	mono
Duration	3second

Table 4. 1 Parameters Specification

On this desired signal AWGN is added to produce noisy signal. Finally using FIR filter noise signal is filtered out. Those signals are presented in the following wave form which is obtained by mat lab simulations.

Recorded speech signal wave

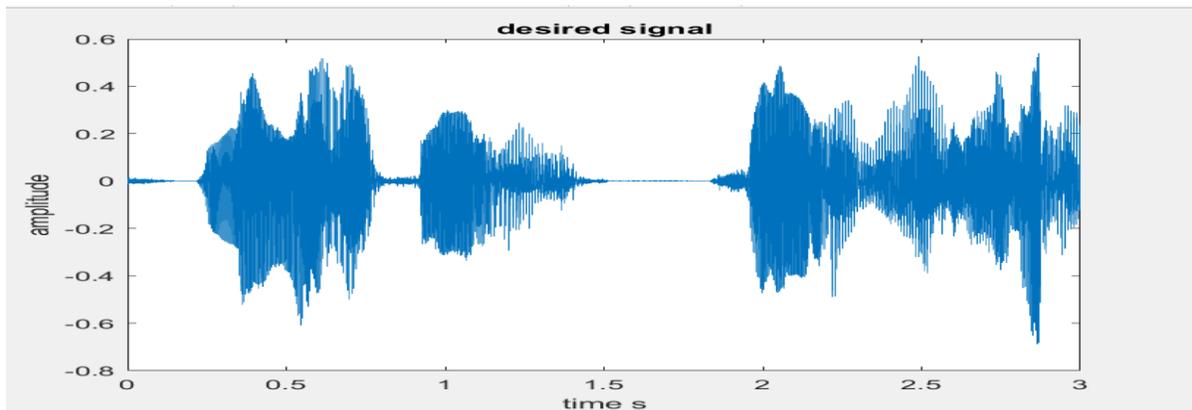


Figure 4. 1. Recorded speech signal, Input signal wave

This recorded speech signal have 24000 number of samples, bitrate (speed) 64kbps and sampling rate of 8000Hz, with a duration of 3second.

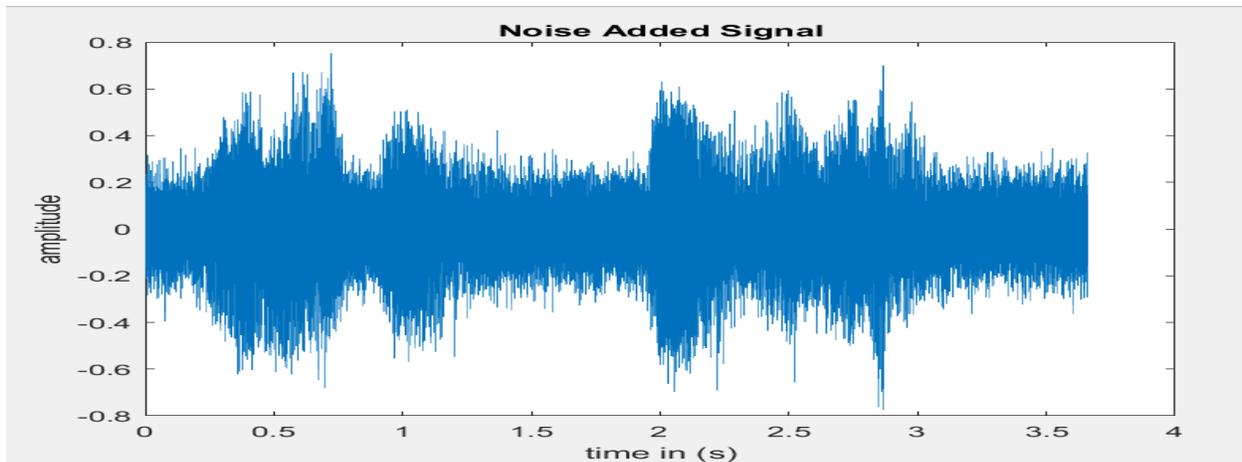


Figure 4. 2. Noisy Signal

Different observations parameters were made to evaluate the variations of the system's performance related to the results of Noise Reduction Ratio (NRR), which measures the performance adaptive filter in dB (decibel). Noise-Reduction-Ratio (NRR) is the measure of quality of the signal by evaluating the ratio of noise power to error power in noise cancelling Mathematically given by,

$$NRR = \frac{\text{noise power}}{\text{error power}} \quad 3.14$$

Where,
 NRR= Noise Reduction Ratio.

$$NRR(dB) = 10 \log_{10}(NRR) \quad 3.15$$

Analyzing signals in different domains

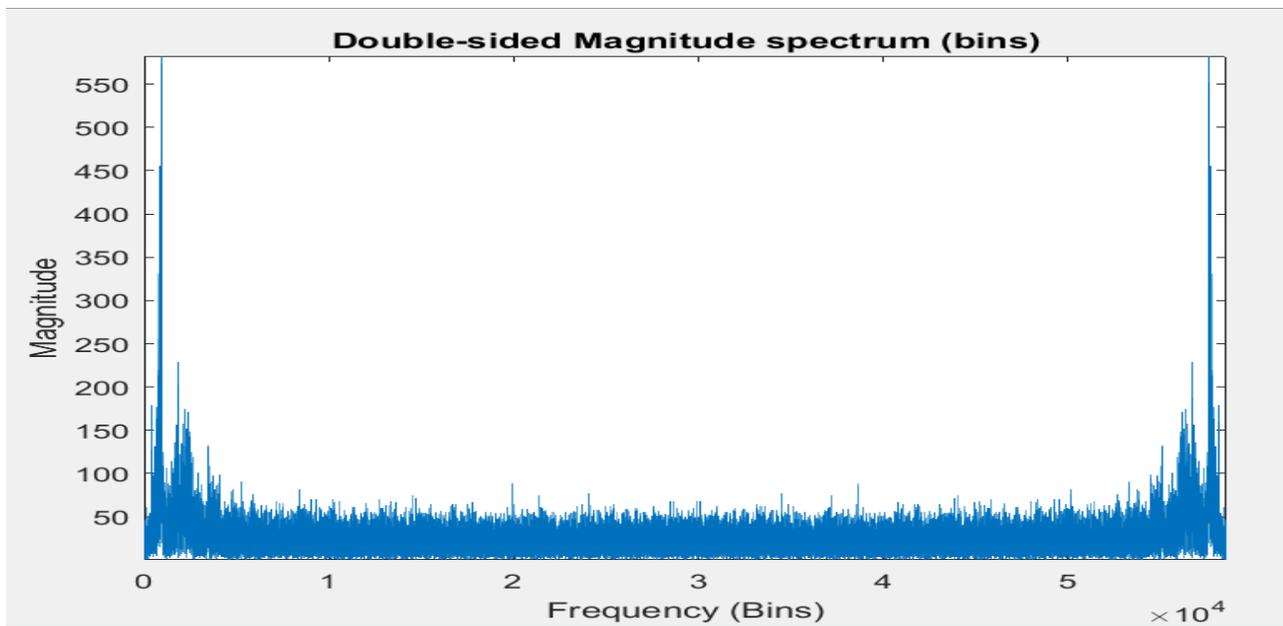


Figure 4. 3. Double Sided Magnitude spectrum in Bins

Double sided magnitude spectrum of noisy signal in frequency domain measured in Bins. Frequency in hertz (Hz) is calculated by multiplying number of Bins values with the ratio of sampling frequency of the signal (Fs) to length of the signal (N). Next, it is needed to fix an appropriate x-axis for the FFT spectrum. In this case, then put the physical frequencies in the x-axis so that we know we are getting maximum at the correct frequencies. This is a very important step. To do that, we need to understand how FFT creates “bins”. For N point FFT, the number of bins created is N/2.

FFT is just an implementation of Discrete Fourier Transform (DFT), in order to discretize the continuum of frequencies, the frequency axis is consistently segmented into finite number of parts which are called bins. It can be considered as spectrum samples. In

our example, the sampling frequency $F_s = 8000$ samples/second. According to Nyquist criteria, the highest physical frequency which can be characterized by its samples without aliasing is simply $F_s/2 = 4000$ Hz. So, basically the frequency spectrum is being segmented into tiles of F_s/N bins. We can now generate suitable frequency axis as displayed in the extract above.

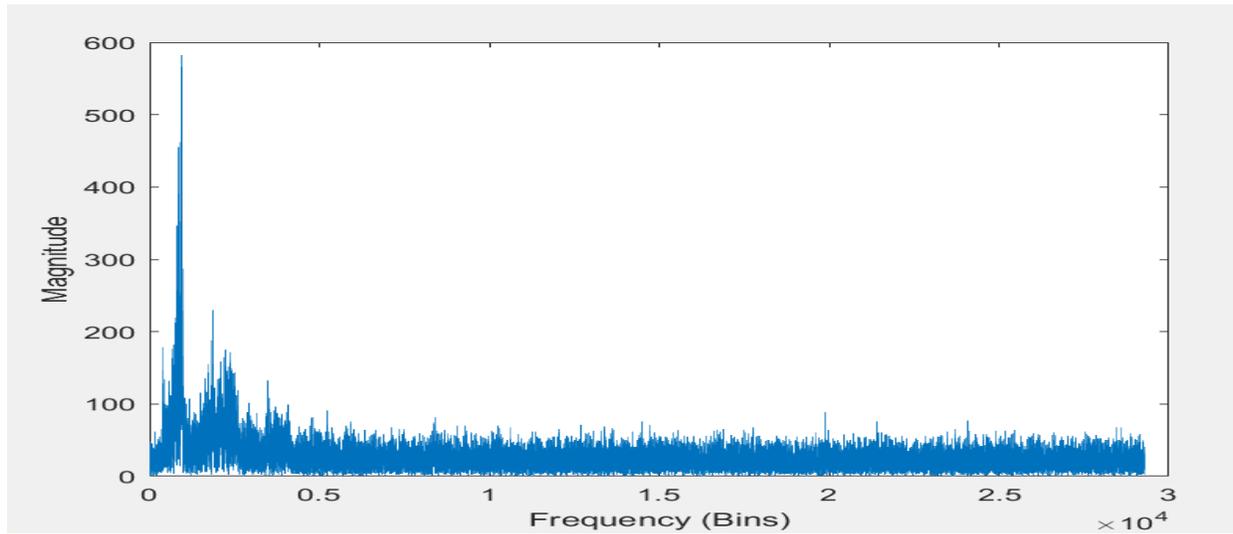


Figure 4. 4. Single sided Magnitude spectrum in Bins

By looking closely, one side of the plot given above it is the mirror of the other side, dropping the peak at 0. This is because, for real signals, the coefficients of positive and negative frequencies become complex conjugates. So, we can use one side of the range to denote the signal. This is characterized by the type of spectrum known as Single Side Band (SSB) spectrum. This is applied to extract the signal by using Fast Fourier Transform (FFT) by not to go other transforms, which is done by taking the one side of the spectrum and multiplying by 2. In turn avoids the coefficients of complex signals for real signal. The returned vector by transform needs appropriate manage since DC component is included, so this should be fixed. At this point the frequency component is has zero value which is in reality real value.

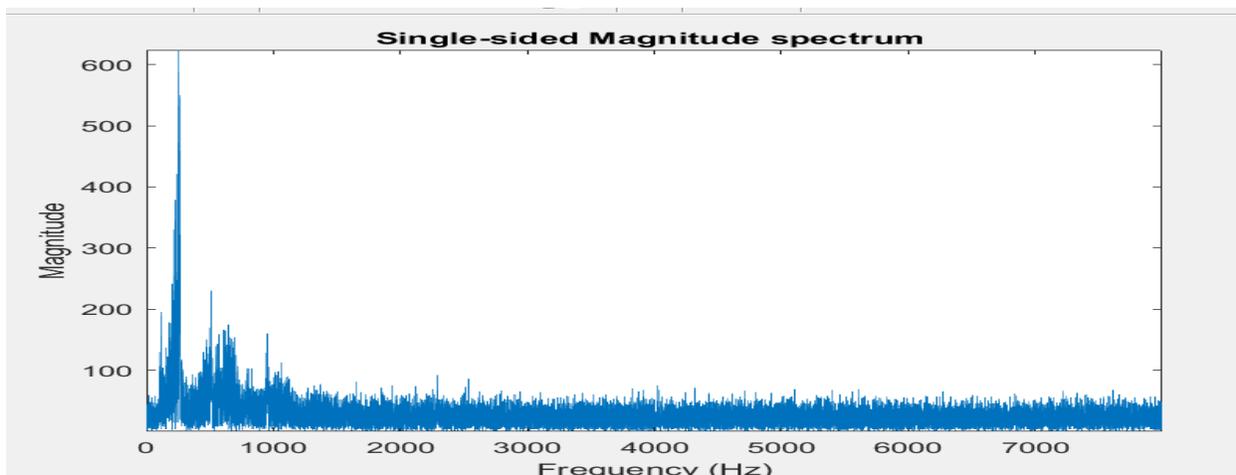


Figure 4. 5. Single sided magnitude spectrum in Hertz (Hz)

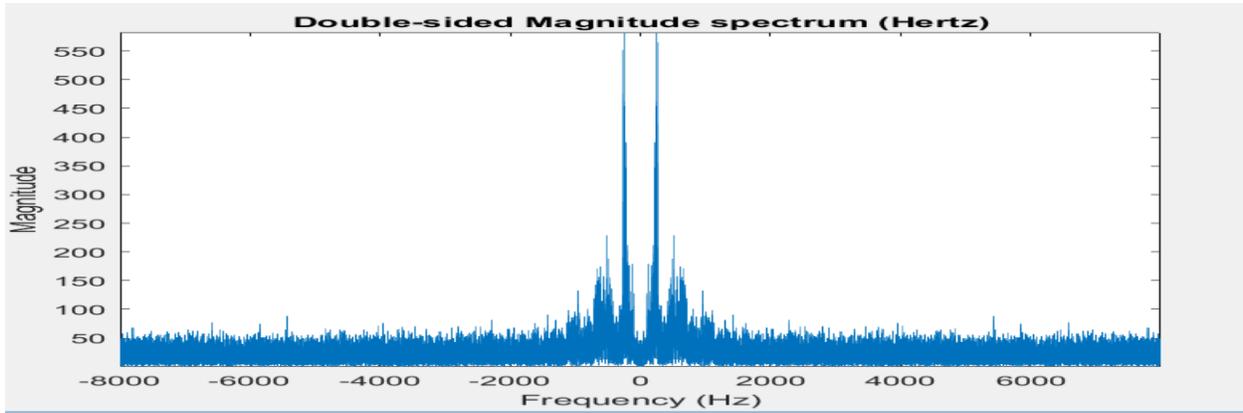


Figure 4. 6. Double sided magnitude spectrum

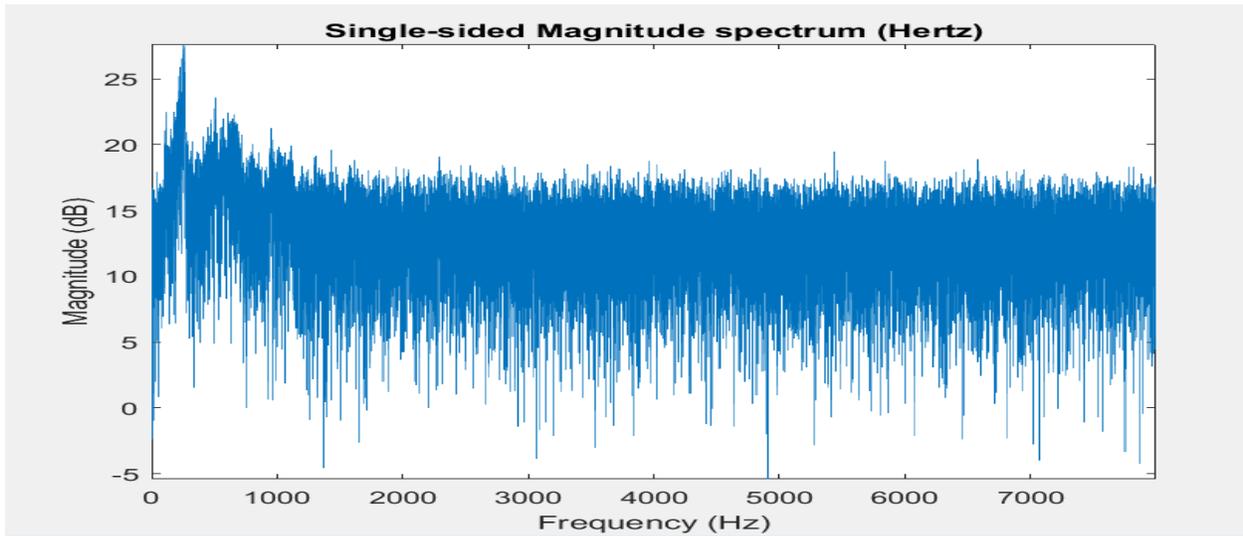


Figure 4. 7. Single sided magnitude spectrum in Hertz

And also power spectrum analysis simulation is done in both double sided and single side spectrum. Which shows the spectral strength at each bin or frequency range or slots. The following plots shows power spectral details in Decibel (dB) along y-axis and with frequency in Hertz along x-axis. The one side shows the power spectrum versus frequency in log scale.

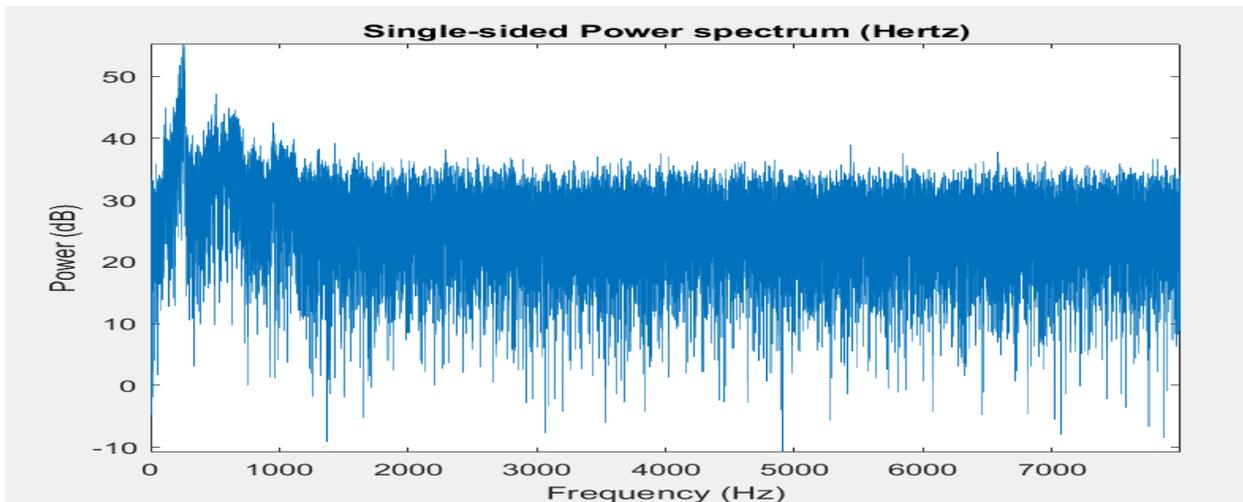


Figure 4. 8. Single Sided Power Spectrum

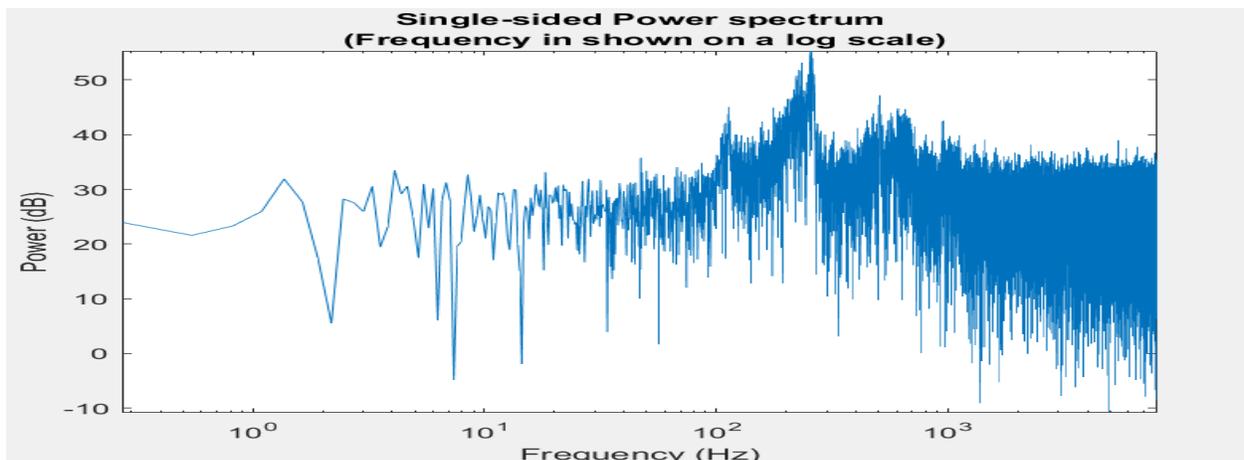


Figure 4. 9. Single Sided Lower Spectrum in Log Scale

Performance of the adaptive noise cancellation, where the value of the current output is feedback to the filter is analyzed using LMS and NLMS algorithms by varying parameters with related to noise reduction ratio.

Input signal to noise ratio (Input SNR)

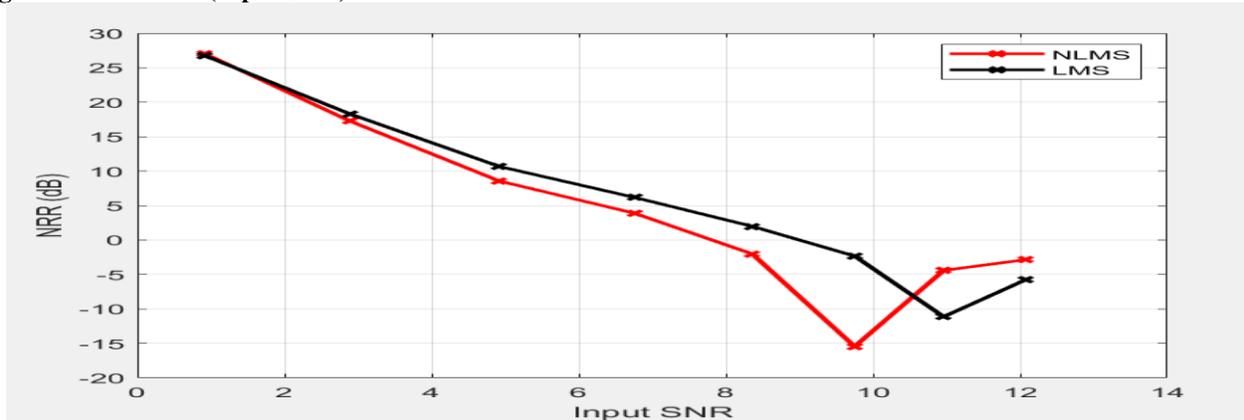


Figure 4. 10. Input SNR versus NRR (dB) for LMS and NLMS

Input SNR is the ratio of the average of signal power to noise power at the input level. High Input Signal to Noise Ratio (SNR) brings high signal quality at the output side of the digital signal processing systems. The impact of varying input SNR on the performance of adaptive noise cancellation with relation to Noise Reduction Ratio (NRR) by using both LMS and NLMS algorithms. And the simulation has taken place by fixing simulation factors such as number of samples: 20000, step size: 0.15, number of filter coefficient: 32. From figure 4.10 as Input SNR increases from 1dB to 9.75dB, the NRR decreases linearly then gradually increases.

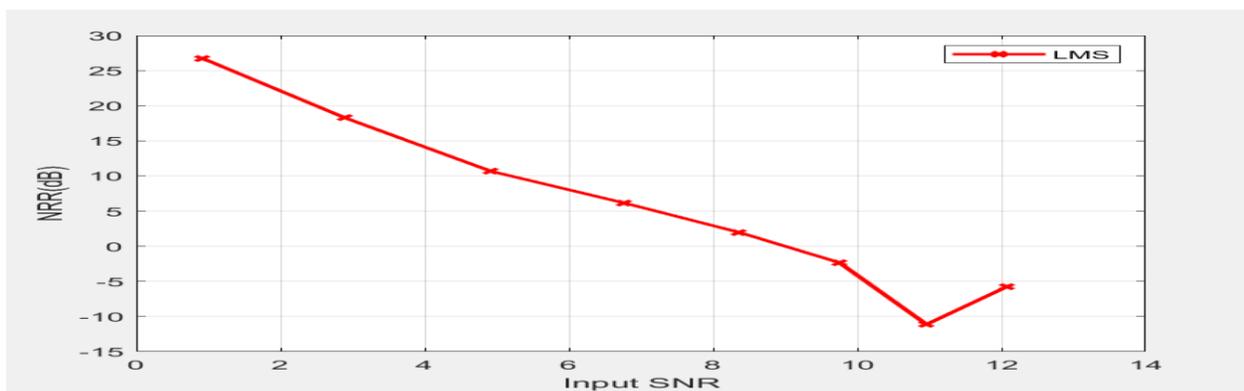


Figure 4. 11. Input SNR versus NRR (dB) of LMS

Based on figure 4.11 input SNR increases from 1dB to 11dB with the decreasing of the respective Noise Reduction Ratio (NRR). After 11dB as input SNR slowly increasing the Noise Reduction Ratio (NRR) linearly increases. The system showed the worst performance at 11dB and gradually increases the system performance as Input SNR increases further using LMS algorithm.

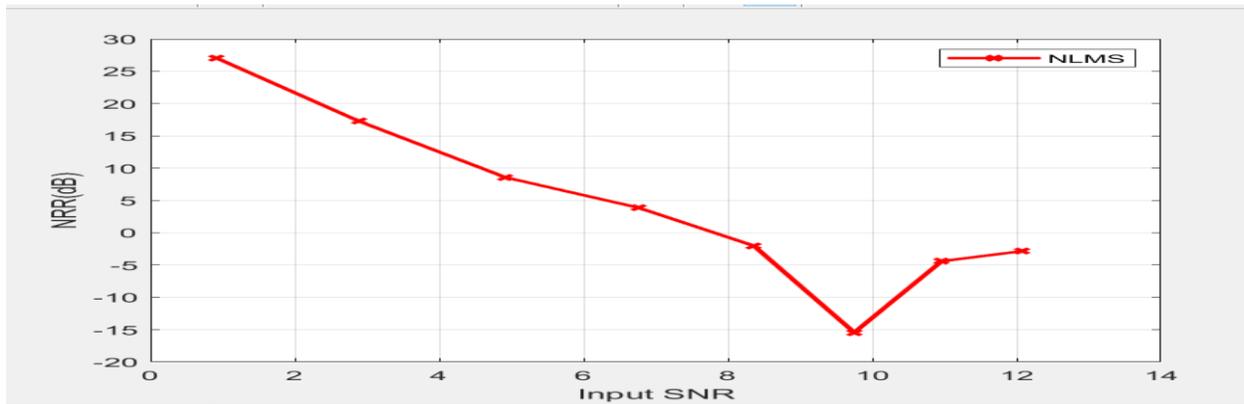


Figure 4.12. Input SNR versus NRR of NLMS

From figure 4.12 input SNR increases from 1dB to 9.75dB with the decreasing of the respective Noise Reduction Ratio (NRR). After 9.75dB as input SNR slowly increasing the Noise Reduction Ratio (NRR) linearly increases. The system showed the worst performance at 9.75dB and gradually increasing the performance of the system as Input SNR increases further using NLMS algorithm.

Number of filter coefficients

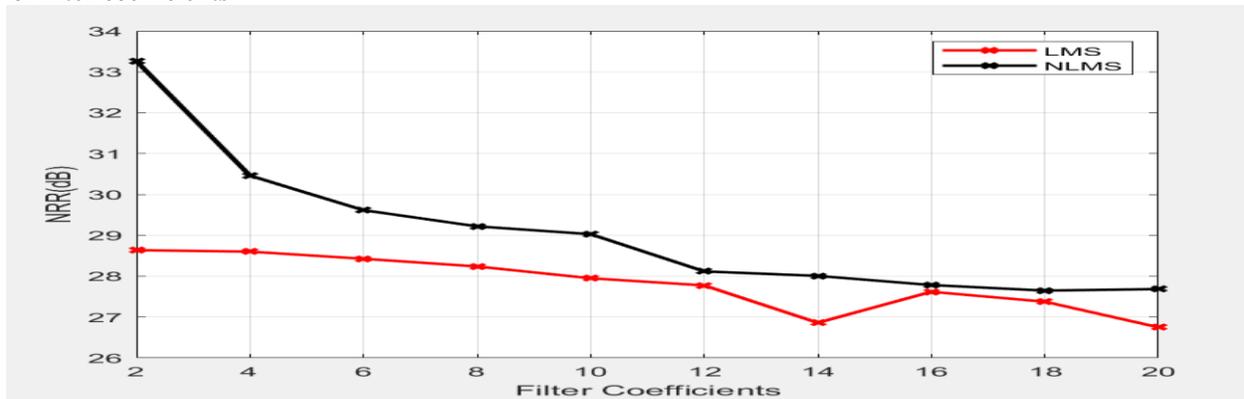


Figure 4.13. Filter coefficients versus NRR (dB) for both algorithms

Number of observations were taken the system performance of the adaptive filter with varying number filter coefficients. Both algorithms decreases the system performance of the filter for first 10 observations as generally seen the algorithm together.

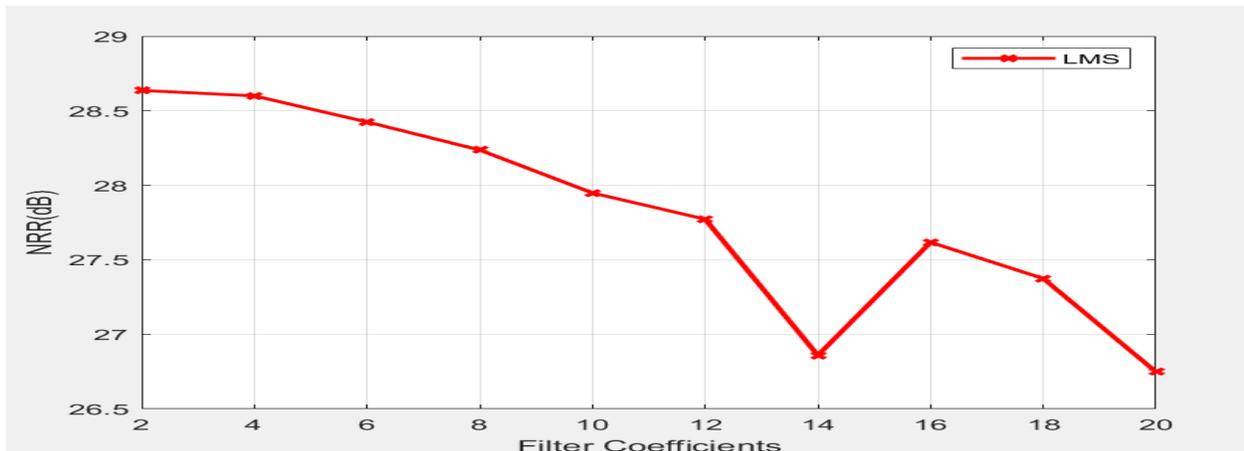


Figure 4.14. Filter Coefficients versus NRR (dB) Of LMS

Figure 4.14 showed the system performance decreases slowly as number of filter coefficients increasing up to 12 and sharply decreases up to 14 then increases sharply till number of coefficients to be 16, again decreases slowly using LMS algorithm of adaptive noise cancellation. When a number of filter is at 16 the system performed well that is the NRR of the system is high, which gives high quality of the signal 27.867dB of NRR within the in a filter coefficients 14 and 20. The simulation is done at the step_size of 0.1.

Varying Step size

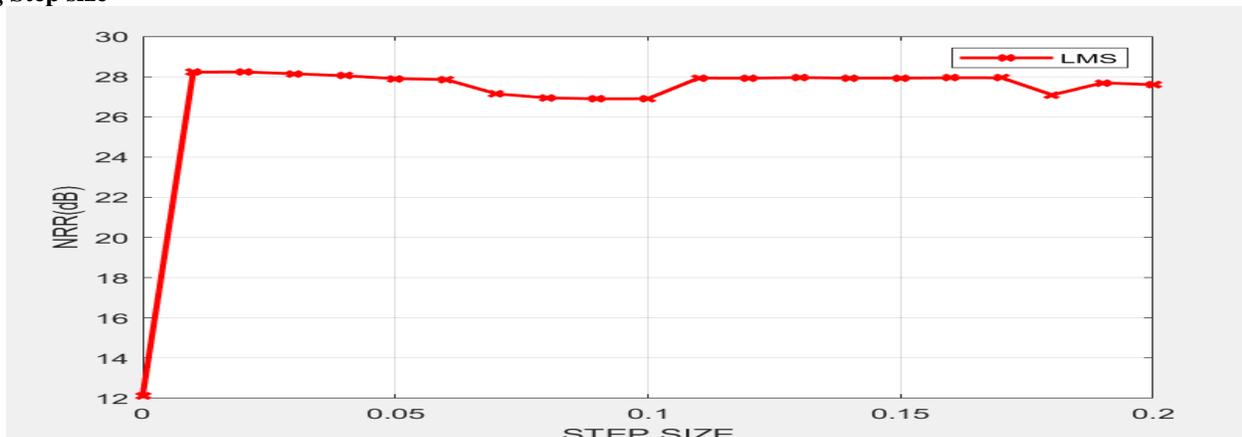


Figure 4. 15. Step size versus NRR of LMS

In above figure the step size of the algorithm changes from within a given range to evaluate the adaptive system performance on noise cancellation with respect to Noise Reduction Ratio (NRR). The system performance is increasing exponentially as number of step size gradually increases from 0 to 0.01 and climax at step size of 0.01 and 0.02 in LMS algorithm with respective Noise Reduction Ratio (NRR) of 28.65 dB and smoothly decreased till the worst performance of the system at step size of 0.1 and the NRR is 26.54dB. Again increased from 0.1 to 0.11 step size which has increased the performance as well. From step size 0.11 to 0.17 the system performance is unchanged. After that it were come to slowly declined. The signal noise power is given that -19.9972

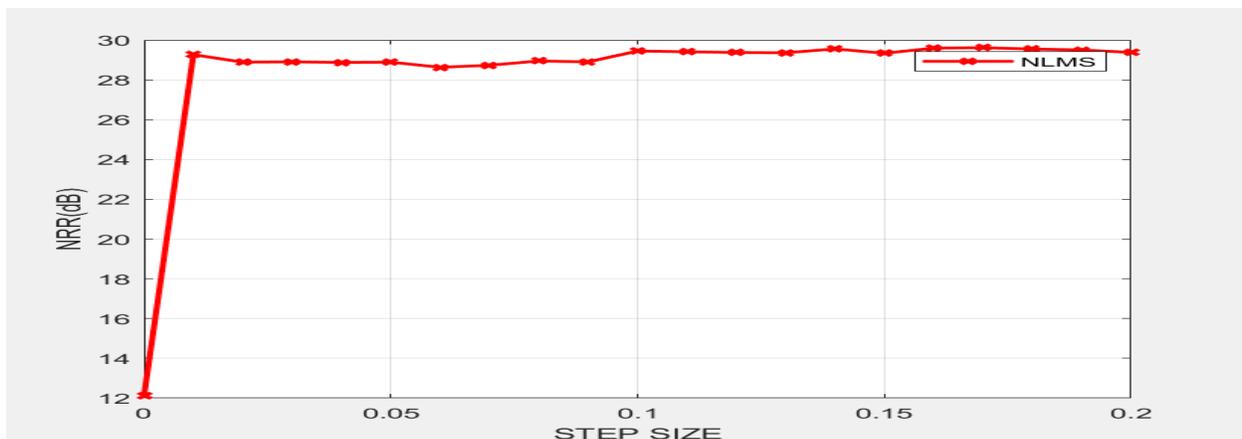


Figure 4. 16. Step size NRR of NLMS

From the above simulation figure the step size of the algorithm is changed with in a given range to evaluate the performance of the adaptive system in noise cancellation with respect to Noise Reduction Ratio (NRR). The simulation result of filter coefficient of 32 is shown above. The system performance is increased exponentially as number of step size gradually increases from 0 to 0.01 and climax at step size of 0.01 and 0.02. With respective Noise Reduction Ratio (NRR) of 28.65 dB and smoothly decreased till the worst performance of the system at step size of 0.06 and the NRR is 28.43dB. And the system is best performed at step size of 0.1 and the NRR of 29.76dB then the system is appeared to be diverged. By taking the values of step size the Normalized Linear Mean Square, NLMS, algorithm relatively brought better recovery of the wanted signal as compared to LMS algorithm.

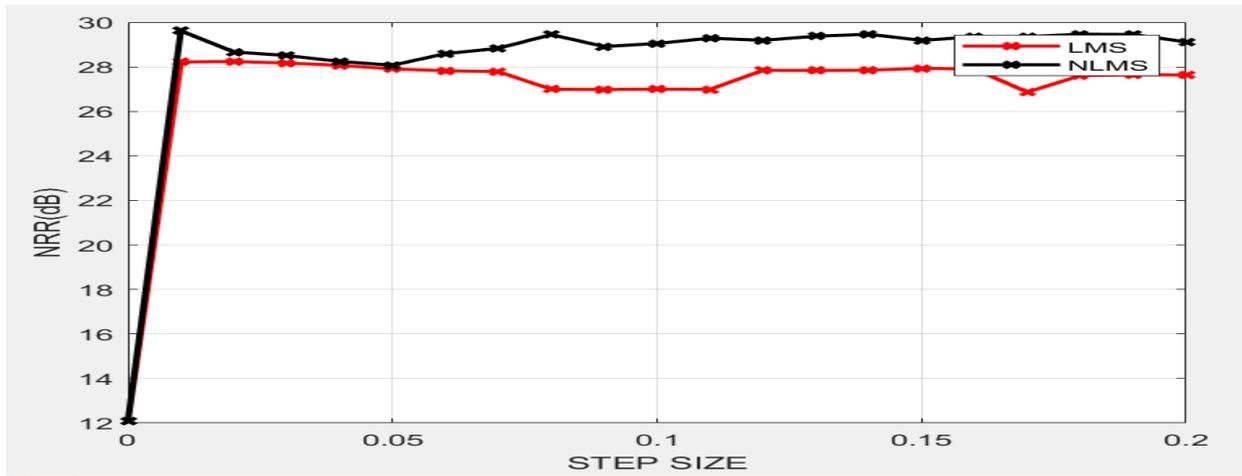


Figure 4.17. Step size versus NRR (dB) of both algorithm

From the above simulation graph the NLMS algorithm reaches the optimum point of recovery of the signal from noisy one at the step size of 0.1.

Number of samples

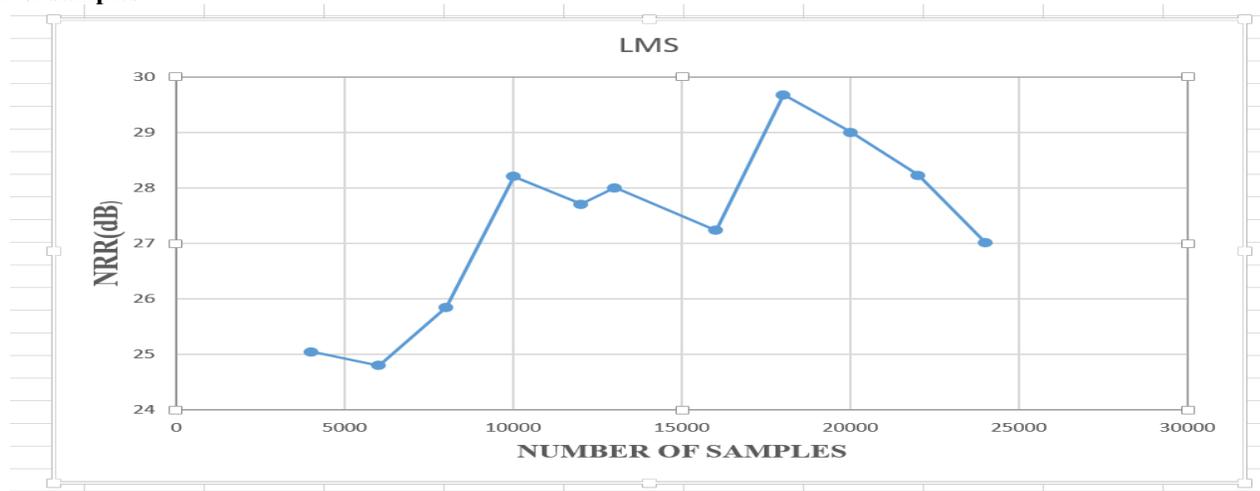


Figure 4.18. Number of samples versus NRR (dB) of LMS

The impact of varying number of samples on the system performance to the adaptive noise cancellation is showed on this above figure. The analysis is done by making one parameter to vary while others were fixed versus noise reduction ratio. The analysis is made by increasing number of samples from 4000 up to 24000. The system has recorded the best and worst signal quality at different point of samples, at 6000 the system produced the NRR value of 24.803dB, which were the lowest quality that has recorded in the range while at 18000 number of sample point the best system performance were showed ,29.6801dB NRR. The filter system could not adapt at the first sample points because of different conditions.

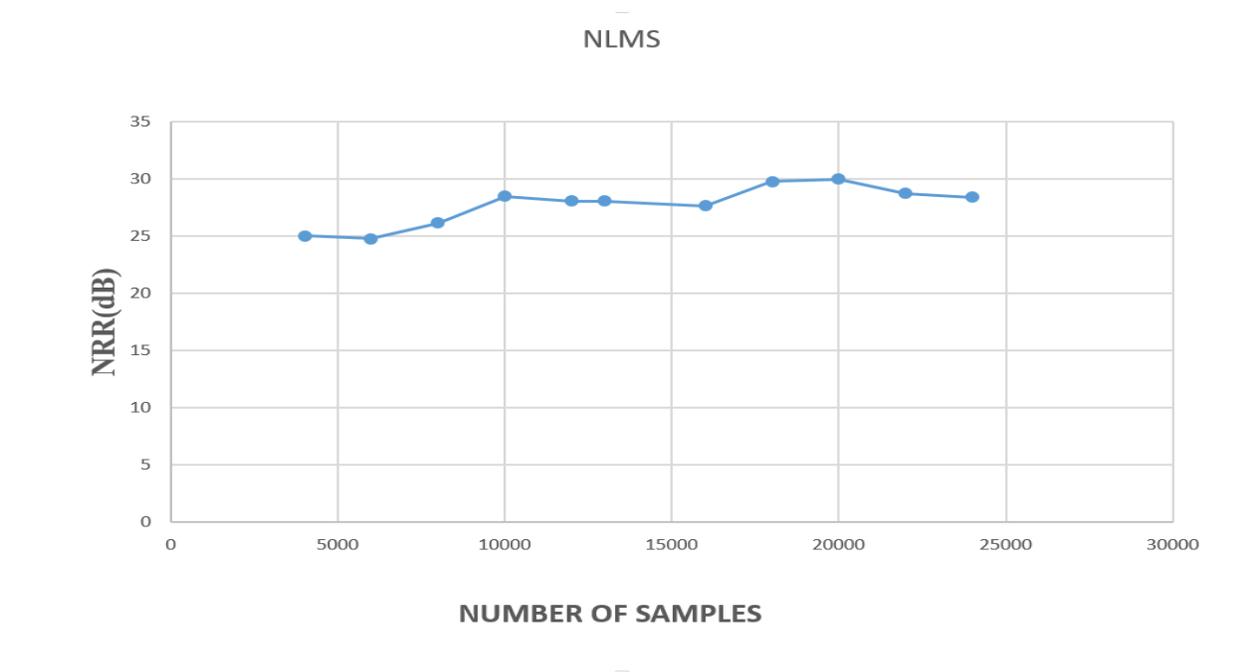


Figure 4.19. Number of Samples versus NRR (dB) NLMS

Under NLMS algorithm the filter is performed well at the sampling number of 20000 with its respective Noise Reduction Ratio value of 29.995dB. At this point the signal is recovered perfectly. After the point of its maximum performance the quality has gone slowly as NRR decreased while number of samples increased. From NLMS algorithm the system it's showed that rapidly adapt to its input change relative to LMS for example the unexpected deviations of the signal. Has a SNR 17.4072

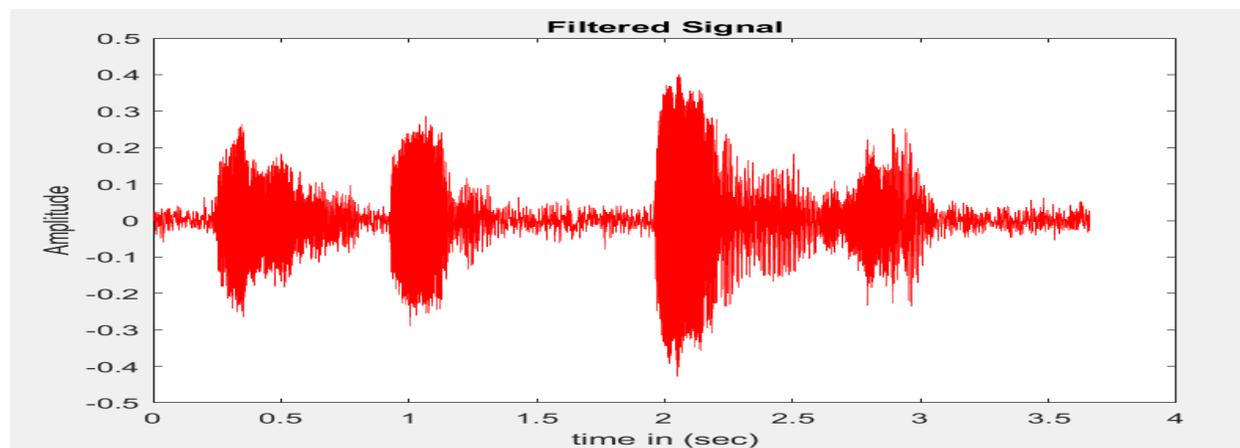


Figure 4.20. Recovered Signal

The extracted speech signal or recovered signal at optimum step size which were different between two algorithms is simulated as shown on the above recovered speech signal. The optimum step size for NLMS algorithm is 0.15 where the best signal is extracted and the filter coefficient used is 32. This recovered wave form of speech signal above is done by NLMS algorithm because of its good performance related with LMS algorithm. The SNR of filtered signal is 26.3720 dB.

V. CONCLUSION

This paper work has concentrated on removal of noise from a particular recorded speech signal using two techniques the Least Mean Square (LMS) technique and the Normalized Least Mean (NLMS) technique. It can be seen that in LMS technique the trends of NRR with varying step size, sample number, input SNR and filter coefficients did not lead to a convincing output. But the normalized LMS method brings us a trend that helps us to analyze the variations of NRR with varying system parameters. The sound filtering is also improved giving us an increased value of NRR as compared to LMS technique.

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Lunch Programme Management And Their Influence On Educational Outcomes In Public Day Secondary Schools In Mombasa And Kilifi Counties, Kenya

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DOI: 10.29322/IJSRP.10.09.2020.p10517

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10517>

Abstract- School feeding programs are primarily intended to enhance educational outcomes with a view to achieving Kenya's educational objectives of free and compulsory basic education. School feeding initiatives have the ability to increase access to primary education, minimize dropout rates, especially at lower primary school levels, and boost pupils' academic achievement. The purpose of the study was to assess lunch program management and its influence on educational outcomes at Mombasa and Kilifi Counties, Kenya's public day secondary schools. Many of the findings were done in elementary schools but not in secondary schools on the impact of school feeding programmes. The research objectives were to analyze the strategies of food safety control used in public day secondary schools and to figure out the monitoring and evaluation methods of the school lunch programme. The sample community consisted of all the Counties' 49 day high schools, 940 teachers, 49 superintendent, 49 lunch coordinators, and 18,847 students. The study utilized simple random sampling and random stratified sampling. Stratified random sampling was used in the following lines. The survey range would cover 17 high schools, 17 head teachers, 17 meal coordinators, 289 teachers and 377 students. For data collection, the analysis employed mixed sample style, questionnaires and schedules for interviews. Data were described using counts, frequency tables for distribution, bar graphs and pie-charts. The study's key results on the achievement of educational outcomes; there were shortcomings in tracking and assessing educational outcomes because most schools have a food safety plan because improved educational outcomes.

Index Terms- lunch programme, educational outcomes, school feeding programs, financial management, procurement procedures

I. INTRODUCTION

Control of food quality and health includes the implementation of hygiene standards to guarantee access to healthy food for the students. Other measures include the safeguarding by the Ministry of Education, the Department of Public Health and the school community of adequate food storage facilities. School officials will take measures to protect the food from rats and from bacterial pollution (MoE, 2001). School feeding schemes enable millions of poor children around the world to attend school effectively (Muvhango, 2016). School feeding systems have the

potential to increase exposure to primary education, reduce dropout rates, especially at lower primary school levels, and boost academic performance for Weru pupils (2014).

World Health Organization (2007) on food safety management indicated that food handlers should be qualified in food-borne disease prevention hygiene practices. This duty takes in the Kenya Ministry of Education (MOEST). The Ministry of Health, Science and Technology (2012) emphasized that a higher standard of education would ensure adequate food health and hygienic activities. Most food handlers failed to wash their hands as required, particularly when they did not offer hand wash basins. Workers in the kitchen need to be able to wash their hands correctly by following the five phases of washing hands: wetting, rubbing soap, 10-15 second wiping of hands and body, thorough rinsing and then drying hands with hand sanitizers or hot air dryers, Food Safety Agency (2006).

According to Richard (1993), certain essential grooming habits included wearing a hat or other hair protection, wearing clean uniforms every day, removing aprons while entering food preparation areas, removing jewellery from hands and arms and wearing appropriate shoes. Kitchens where food has been prepared need to maintain high cleanliness. Water was a major commodity for eating, cleaning and cooking food, washing up, washing hands, equipment, utensils, pots, garments and much more. Bad management activities induce food spoilage that can lead to serious illness (Wandolo, 2016). Poor food handling is threatening product quality and health. Many personal hygiene practices, such as wearing a new cloth every day.

A research by Wandolo (2016), found that the most important factor in the prevention of food poisoning is the personal hygiene of food handlers. Public hygiene consists of: clean hands and body, ensure proper public cleanliness, wear clean and appropriate clothes, follow hygienic sanitary procedures and promote good health and record any ill health. Children are at high risk of food-borne diseases; healthy food planning was therefore essential in school lunch programs (Richards et al., 1993). The meals consumed at lunch time would be nutritious and safe (Shield & Mullen, 2002). Absenteeism affects a student's success in colleges, especially where there is an outbreak of food-borne diseases. The school's management team, in collaboration with parents and members of the group, would ensure that the learners are given a hot meal every day. It not only improved efficiency but also enhanced understanding. Appropriate care should be paid to learners with special needs, in addition to their nutritional

requirements. Different research by Glewwe and Miguel (2008) on the impact of diet and safety among students on schooling for children in developed countries suggested that learners be taught how to monitor and avoid some of the contagious diseases as well as good hygiene.

Monitoring is a regular and structured information collection that helps track success when preparing and executing a program or project. This means the right message is done in the right way to the right people. According to a report by UNESCO (1999), many initiatives are impaired by a lack of adequate supervision and assessment. Monitoring and review consists of two main components: i provide feedback on implementation of the project to allow early detection of defects and provide solutions (ii) notify about program impacts of the project toward its stated goals. The Government's experience of implementing school meals to date has shown the need to improve monitoring and assessment thoroughly based and linked together with Education Management Information System (EMIS) at the national level.

The SFMC should also prepare duty iota for all those involved in school feeding programme. Accountability statements should be prepared that describes the committees' role in the SFP. This could demonstrate how they would perform oversight roles so that students got what they were meant to get from the SFP. The SMC documents cases of complains from students and parents which are used to improve on the program delivery by taking appropriate measures (Carozza, 2003). While many outside agencies can evaluate SFP, a few have the know-how and skills to employ monitoring and evaluation approaches and fewer still are able to design and implement effective monitoring and evaluation system (World Bank, 2004).

According to (Kibet, 2017) monitoring and evaluation should ensure checks and balances for the programme implementation, and whether the targets and objectives are met. Monitoring and assessment by experts and partners is of greater value due to the increased input they offer on the success state of the project. Through proper monitoring and evaluation, delays, project variations may be quickly detected by frequent reporting and prompt corrective steps taken in good time, so monitoring and assessment has a very important function in programme management (Lawal and Onahaebi, 2010).

II. RESEARCH DESIGN AND METHODOLOGY

The researcher used the mixed research methodology (qualitative-quantitative). This approach was useful because it had the ability to test relevant theories and obtain in depth information from the participants (Tashakkori & Teddlie, 2003). The research used questionnaires to collect information from principals, teachers and pupils. Questionnaires are a cost-effective way to collect data from big samples. Gay (1992) notes that questionnaires are useful because they allow for the privacy of the views and ideas of the respondents. The questionnaires included both open ended, and closed questions. The investigator utilized the supervisors support and expert opinions to enhance the validity of the instruments. As per (Borg and Gall, 1989), an instrument's content-validity is obtained through expert judgment. The researcher received assistance from his supervisors who helped improve the quality of the instruments' material. The validity test

was performed to determine the appropriateness and clarity of the response items. Ambiguous and insufficient elements were omitted or changed to boost instrument accuracy.

A pilot study allowed the researcher to clarify the accuracy of the questionnaire items so that the ambiguous items were either changed or entirely eliminated. The Cronbach alpha coefficient is the most commonly used indicator for internal accuracy evaluation. We tested reliability using the Social Sciences Statistical Package (SPSS). The SPSS findings are given below for the questionnaire for the principal, the questionnaire for the teachers and the questionnaire for the pupils.

Table 1: Summary of Cronbach alpha coefficient for study variables

Questionnaires	Number of items	Cronbach's Alpha	Cronbach's Alpha
Principals' Questionnaire	36	0.951	0.949
Teachers' Questionnaire	31	0.963	0.963
Students' Questionnaire	8	0.910	0.90

Participants in the research participated in a voluntary manner, free from coercion. Investigation was conducted competently and with due concern for the dignity and welfare of the participants. Standard ethical considerations were abided to, in the study period by the researcher. Respondents were also informed of their rights in research participation, withdrawing from the research at any time of the study was granted. High level of discipline, respect towards the respondents was displayed while conducting out the investigation. The investigator was knowledgeable on the area that he was studying and was therefore adequately prepared to handle any issues that emerged from the study.

III. RESULTS AND DISCUSSION

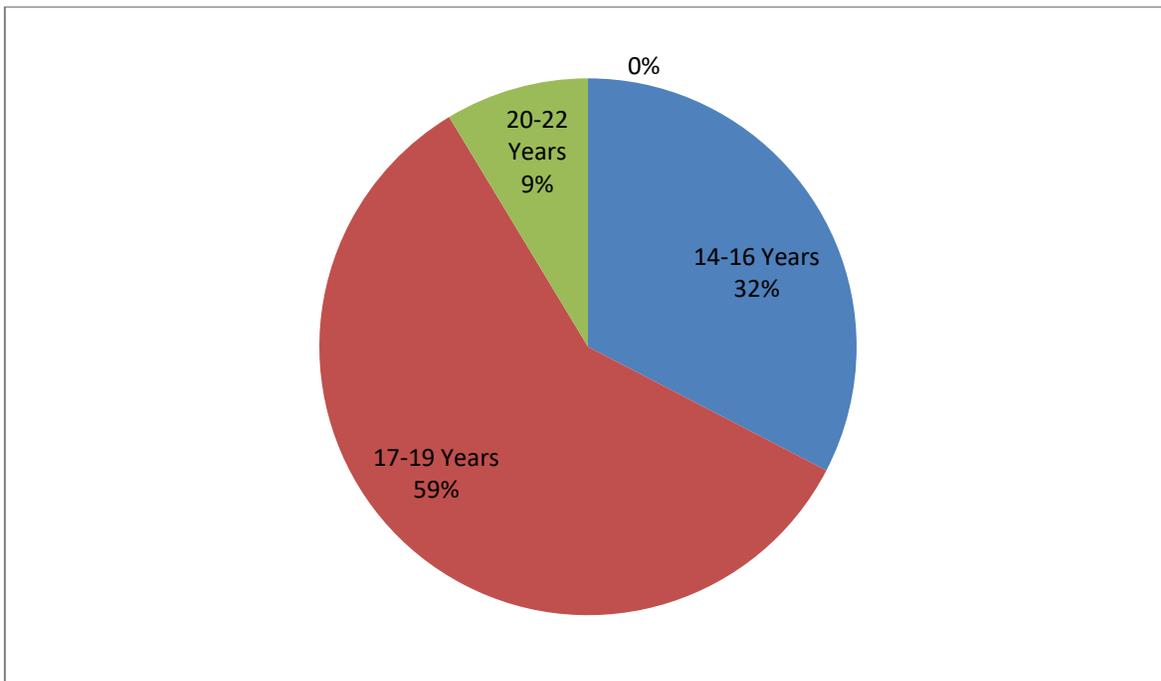
The study sought to determine the gender of the students participating in the study. Table 4.6 provides the demographic data for student class in both the Mombasa and Kilifi Counties.

Table 2: Gender of students

County	Mombas		Kilif		Tota	
	N	%	N	%	N	%
Student						
Male	120	35.29	75	22.06	200	58.82
Female	80	23.53	65	19.12	140	41.18
Total	200	58.82	140	41.18	340	100.00

Table 2 indicates that the majority of the students 200 (58.82%) were male while slightly below half 140 (41.18%) were females. There were more than half of students 200 (58.82%) in

Mombasa County than in Kilifi 140 (41.18%).The respondents were asked to state their age. The findings are shown in Figure 1.

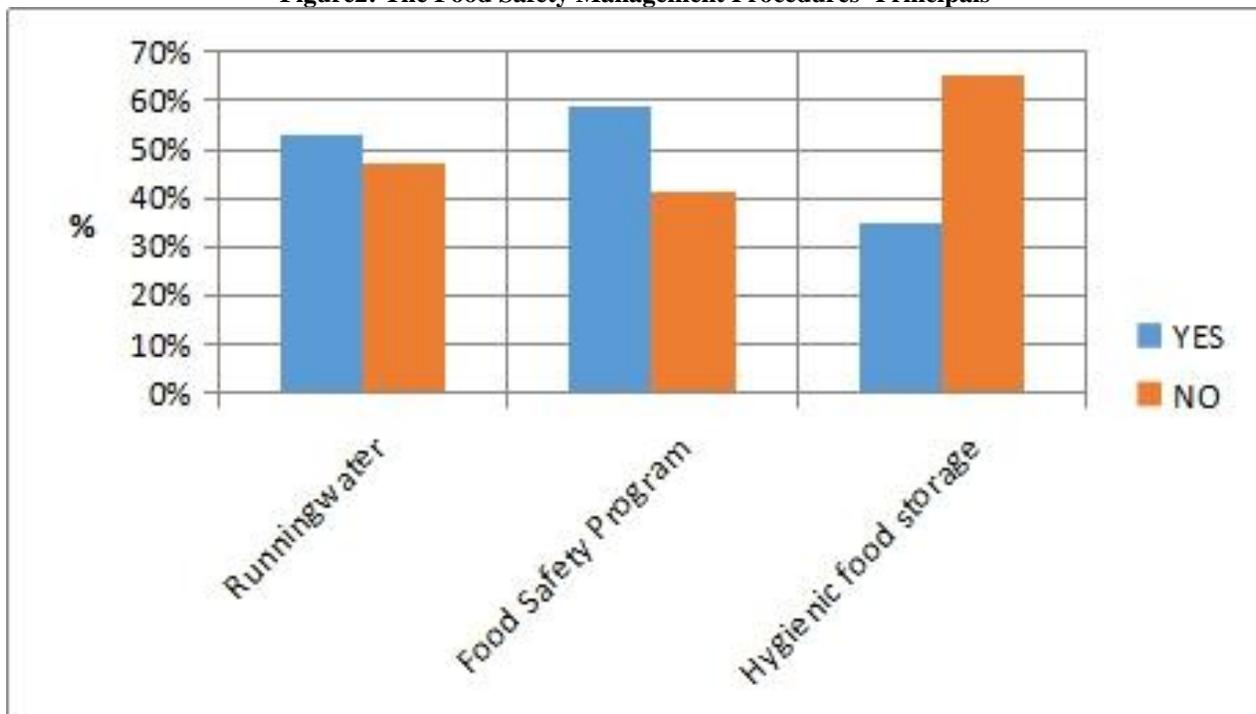


The bulk of respondents (59 percent) were aged 17-19 years from figure 1 above, while the minority (9 percent) was 20-22 years in the age group.

The first objective aimed to assess the lunch program's food safety management and its influence on educational outcomes in Mombasa and Kilifi Counties, Kenya's public day secondary

schools. The study sought to find out about managing food safety and its influence on educational outcomes in order to address this goal. The results of principals on food safety management procedures are represented in figure 2.

Figure2: The Food Safety Management Procedures- Principals



From figure 2 more than half of the principals 9 (53%) indicated that the school had running water, while 8 (47%) indicated that the school had no running. Majority of the principals 10 (59%) indicated that their school had a food safety program while 7 (41%) did not have. Most of the principals 11 (65%) stated that their schools had no hygienic food storage while 6 (35%) of the schools had. Such results are in line with MoE (2008), which discovered that food-borne pathogens existed in school environments due to causes including contaminated food, inadequate hygiene habits and inadequate planning. The study findings agree with studies done by (Wandolo, 2016) which found out that food safety and hygiene practices in the schools were not

strictly followed in the institutions. The research findings agrees with (Snow, 2011) who reported that most of the behavioural problems and academic performance faced by students in classroom situation is as a result of inadequate nutrition and inadequate understanding of the concept nutrition and its advantages. For children advancement and bright futures it is paramount to try to mitigate on the issue of undernourishment. The research also tried to evaluate the effect of the teachers' supervision and evaluation processes on instructional results. The findings are shown in table 3

Table 3 :Monitoring and Evaluation Procedures of School Lunch Programme and their influence on Educational Outcomes- Teachers

Indicators of Educational Outcomes	Improved performance	Improved discipline	Improved health status	Active participation in class	Improved time management
Improved performance	1	.983*	.993**	.941	.996**
Improved discipline	-.941	1	.732	.960	.971*
Improved health status	.993**	.997**	1	.971*	.987*
Active participation in class	.941	.970*	.971*	1	.945
Improved time management	.996**	.971*	.987*	.945	1

Table 3 shows the influence of monitoring and assessment procedures among indicators of educational outcomes in Mombasa and Kilifi County, Kenya. The relationship between improved performance and improved discipline is 0.983, for improved discipline and health status is 0.732. The relationship between improved performance and improved time management is 0.996 was statistically significant, $p > 0.01$. All the other pairs of educational outcomes pair were greater than 0.7 which was acceptable for our study. The study findings on association between monitoring & evaluation procedures and educational outcomes were very high and very close to one. These study findings agrees with (Sanya, 2015) who reported that monitoring and evaluation addressed the educational outcomes such as the levels of absenteeism, pupils' level of concentration and whether the number of dropouts has reduced. Other indicators include academic performance, wellbeing and health status. A positive impact from these components indicated that programme objectives had been achieved.

IV. SUMMARY AND CONCLUSION

Based on the objectives and the findings this study, the following conclusions were made;

1. To examine food safety management and its influence on educational outcomes in public day secondary schools in Mombasa and Kilifi Counties, Kenya.
2. To find out Monitoring and evaluation procedures of school lunch programme and their influence on educational outcomes in Public day secondary Schools in Mombasa and Kilifi Counties, Kenya.

The study found that most of the schools had a food safety programme which influenced attainment of educational outcomes. This was because students fed on hygienic food and cases of food poisoning were minimized. This ensured regular attendance to schools which lead to improved performance. However the study found out that most of the schools had no hygienic food storage which leads to food spoilage hence affecting achievement of educational outcomes negatively.

It was found out that most of the respondents indicated that majority of the cooks had clean uniforms and were well groomed.

The study found out that food supervision and food serving were not supervised. The study also found out that checking of food grains was monitored. The relationship between School Lunch Program Monitoring and Evaluation Procedures on Educational Outcomes was statistically significant at $r=0.945$, $p>0.05$.

Objective one: To examine food safety management and its influence on educational outcomes in public day secondary schools in Mombasa and Kilifi Counties, Kenya. From objective three the study found challenges on financial management of lunch programme and recommended the following:

1. Board of management should ensure the stores where foodstuffs are stored are cleaned and fumigated regularly.
2. MOEST to enforce schools to have water tanks for storage and water harvesting.

Objective two: To find out Monitoring and evaluation procedures of school lunch programme and their influence on educational outcomes in Public day secondary Schools in Mombasa and Kilifi Counties, Kenya.

1. Board of management should ensure there is efficient monitoring and evaluation of lunch programme in their school.
2. Teachers in charge of lunch programme /lunch programme coordinators should not be burdened with other responsibilities for effective Monitoring and evaluation.

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Human Resources: Employees' perspective of Employee Potential Utilization and Corporate Training

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DOI: 10.29322/IJSRP.10.09.2020.p10518
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10518>

Abstract- There are 3 main objectives of this research paper. First, to provide an accurate and an indepth understanding of employees' perspective of how effective the organization is at utilizing its employee potential. The research tries to capture the perspective of 3 categories of participants, i.e. employees with work experience less than two years categorized as freshers, interns with an internship experience of at least 3 months and employees with work experience of more than 2 years. Second, to capture the employees' perspective on the role of Corporate Training in achieving employee potential and the necessary improvements that can improve corporate training effectiveness. Third, to propose a tangible solution designed by a synergy of tested approaches that can help organizations to maximize the utilization of employee potential and achieve better performance.

Index Terms- Effectiveness, Efficiency, Employee Potential, High Performance, Human Resource Management, Performance Management

I. INTRODUCTION

While technology, today, is disrupting processes and change across the organizations, human resource is at the core of every organization driving this change. Human Resources, also referred to as human capital/workforce/personnel are the people who make the business processes across organizations possible and Human Resource Management or HRM is the process of managing the Human Resources or personnel pool of an organization to achieve the strategic goals of the organization. Human Resource Management is defined as the process of acquiring, training, appraising, and compensating employees, and of attending to their labour relations, health and safety and fairness concerns^[1] and is typically made of activities that involve Strategy and Legal Compliance, Recruitment, Selection and Onboarding, Training and Development, Performance Management, Compensation and Rewards, Employee Relations.^[2]

Performance management is a continuous process of identifying, measuring, and developing the performance of individuals and teams and aligning their performance with the strategic goals of the organization. So performance management is a key tool to transform people's talent and motivation into a strategic business advantage.^[3] In other words, Performance Management is simply to keep track of how well your employee is doing his/her job, in what way can his/her work performance be improved, what are

his strengths and weakness and how to act upon them towards achieving organizational goals. The end goal of Performance Management is to tap into an employee's potential to achieve high performance aligned towards organizational strategic goals for better profits. An efficient Performance Management System aligns the goals of employees to the overall organization strategy, it addresses the weaknesses of employees and at the same time acts on their strengths. It is like clockwork with a complicated series of wheels(employees), gears(process), and levers (managers and leaders) all working in perfect harmony to display the correct time(achieve strategic goals and run the organization).

A well-defined Performance Management System also addresses multiple objectives, such as *Strategic objectives* by linking employee goals to organizational strategy, *Administrative objectives* in administrative decisions such as promotions, retentions, terminations, *Informational Objectives* in communicating employee strengths and weaknesses, *Developmental objectives* to shape career paths and meet expectations, *Organizational Maintenance objectives* in workforce planning and talent inventory, and *Documentation objectives* to document critical information such as critical incidents etc.^[4]

Often, the performance of employees is managed in terms of their competencies in organizations. Competency, in simple terms, is the skills required by an employee to efficiently and effectively perform his/her job. Organizations use employee competency to measure his/her performance, which also acts as the driver for classifying employees as high performers and low performers. In other words, competency is an organization's perspective or tool of determining who amongst the employees is a high performer and who is not. While competency of an employee determines the skillset required to complete a task effectively, it fails to take into account an employee's potential or his/her perspective of the effective utilization of this potential by the organization to develop competency towards high performance.

In this research, the first objective attempts to capture an employee's perspective of how successful an organization utilizes his/her potential to be a high performer.

The second objective of the research highlights the employee's perspective on the effectiveness of corporate training towards achieving better job performance and ways of improving corporate training. Corporate Training or workplace learning is the process of improving employees' Knowledge, Skills and Abilities by providing them with the necessary training and resources. There are multiple objectives that Corporate training

can help achieve, such as, addressing skill gaps, learning new technologies, behavioral coaching for leadership skills, compliance training for legal awareness, etc. Corporate training is a system of activities designed to educate employees. While it helps employers, it is also beneficial for employees as it helps them obtain and hone knowledge and skills to progress professionally and personally.^[5] Corporate Training is most effective when delivered to employees in the format that they find most effective. There are several formats in which it can be delivered, such as, Instructor-led training, eLearning, Simulation employee training, Hands-on training, Coaching or mentoring, Classroom Lectures, Group discussion and activities, case studies, On the Job Learning, etc.^[6]

II. LITERATURE REVIEW

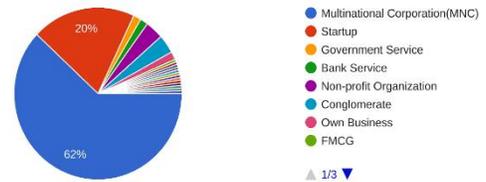
Employee Potential is the ability of an Employee to contribute to the organization in one or multiple roles most efficiently and effectively possible. The term "Potential" is used to suggest that an individual has the qualities (e.g. characteristics, motivation, skills, abilities, experiences etc.) to effectively perform and contribute in broader or different roles in the organization.^[7] An employee's potential in an organization often correlates to the overall Performance an employee exhibits in his/her work. Typically, Employee Performance is a subjective metric that measures how well an employee completes the tasks assigned to him/her. The term "employee performance" signifies an individual's work achievement after exerting required effort on the job which is associated through getting a meaningful work, engaging profile, and compassionate colleagues/employers around.^[8] Employees with better efficiency and effectiveness of work exhibit higher performance. In simple terms, higher the employee potential, better is the performance. This translates to define Employee Potential as the sum of efficiency and the effectiveness an employee exhibits in achieving their task. Often, effectiveness and efficiency are used interchangeably. However,

it is to note that they are distinct and differ by a great margin. To be effective in one's work is to pursue the right goals or be assigned the right tasks by an employer. From an organization's perspective, to be effective is to have the right job fit for an employee. Whereas, efficiency is completing a task with the minimal waste of time, effort and resources. In other words, efficiency is to be highly productive in the task completion process. Performing the right task with maximum productivity produces maximum performance. While organizations strive to achieve maximum performance in their employees, it often fails to take into account an employee's Performance i.e. the effective and efficient way of utilizing his/her potential from an employee's perspective. It is only when an employer's expectations meet an employees' perspective of his/her abilities to achieve maximum performance that an organization is successful in tapping into an employee's total potential. The following research data is collected from 200 working professionals with internship experience, work experience less than 2 years classified as freshers and those with work experience greater than 2 years to support the claim. This research is based on primary data collected from 200 participants who have worked across different professional domains or sectors categorized by their respective work experiences as participants with an internship experience of at least 3 months, professionals with a work experience of at least 2 years categorized as freshers and professionals with more than 2 years of work experience. The primary objective of the data collected is to shed light on the perspectives of employees of how the organization has utilized their potentials to work, the effectiveness of corporate training and ways to improve its effectiveness and how the utilization of employee potential can be made more efficient and effective.

III. RESEARCH FINDING

Following details the research finding from the survey conducted with 200 participants. The work experience distribution of the participants stands at 55.5% of respondents having work experience of more than 2 years followed by 31% of participants being freshers (refer Figure 1). With most of the respondents, 62% are from a Multinational Corporation (MNC) followed by 20% respondents from Start-ups; the survey collates data from participants of Government service, Bank, Non-profit Organization, FMCG, Conglomerate and own business (refer Figure 2). With 76% of the participants informed of what it meant to be a high performer, a near 1/4th, 24%, of the total respondents were not aware of the standards that define high performance at their respective workplace (refer Figure 3). Employee efficiency is defined as doing maximum work with the least waste of time and effort. Often, organizations quantify employee efficiency and effectiveness for performance appraisals, however, it is necessary to understand an employee's view of an organization's ability to utilize his/her potential efficiently and effectively. Efficiency from an employee's perspective of his/her organization is the ability of the organization to use his/her potential to work with the least waste of time and effort. Effectiveness from an employee's perspective of his/her organization is the ability of the organization to use his/her potential to work with the right goals and milestones ensuring a perfect or a near-perfect job fit. While 68.5% of the respondents feel that their potential was efficiently utilized by their organizations, a staggering 31.5% of the employees feel that their potential was not efficiently utilized. The statistics for the employee's perspective of his/her organization to utilize his/her potential effectively stands at 60.5% to 39.5%, with a staggering 39.5% of the respondents feeling that their potential was not effectively utilized by their respective organizations. The research survey addresses the ways to improve the efficient and effective utilization of employee potential by an organization from an employee's perspective. Of the 200 respondents, 120 of the respondents find Recognition and Appreciation of work the primary driver to improve the efficient utilization of the potential of employees by an organization, followed by 112 respondents who find clear and focused goal setting as the next best approach. Figure 5 gives a clear understanding of the respondents' perspective of what helps to improve the efficient utilization of employee potential from an employee's perspective. Of the 200 respondents, 107 of the respondents find keeping goals clear and focused the primary driver to improve the effective utilization of employee potential by an organization, followed by 99 of the respondents who find that communicating the big picture or the strategic implication of their work the next best approach. Figure 6 gives a clear understanding of what improves the effective utilization of an employee's potential from an employee's perspective. The second part of the survey data emphasizes the importance of corporate training to effective job performance and the ways to improve corporate training by organizations. On a scale of 1 to 5, with 1 being minimum implying that corporate training has no effect on job performance and 5 being maximum implying that corporate training plays a significant role in employee's performance, 102 of the respondents rate the effectiveness of corporate training on job performance with a 4 and 55 of the respondents rate it with a maximum score of 5 while only 3 believe that corporate training does not affect job

I work in a
200 responses



performance. 137 of the respondents find the feedback system in corporate training to understand Employee requirements the primary driver to improve corporate training, very closely followed by 133 of the respondents who have responded corporate training is effective when it translates to actual work right away.

IV. RESEARCH FINDING CONCLUSION

From the research findings, defining High Performance and the standards that define High Performance of a particular role plays an important role in effective employee performance. The efficient utilization of employee potential by an organization is driven by the proper recognition of work and achievements and set clear and focused goals which help employees to achieve high performance. The effective utilization of employee potential which translates to the right job fit is primarily driven by Clear and Focused goal setting followed by the effective communication of the bigger picture or the role that one's job plays in the overall organization strategy. Also, corporate training plays a dominant role in achieving better job performance with corporate training followed by employee feedback catering to the employee requirements and training that translates into actual work right away being some of the ways to best improve corporate training.

I have:
200 responses



Figure 1: Respondents distribution

Figure 2: Respondents workplace distribution

I was made aware of what it means TO BE a HIGH PERFORMER from the get-go in my line of work
200 responses

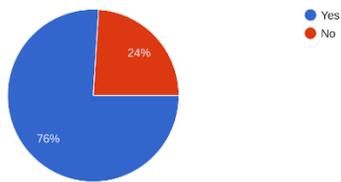


Figure 3: High-Performance Awareness

"EFFICIENCY" means to perform in the best possible manner with the LEAST WASTE of TIME and EFFORT and be productive. The organization I work for has efficiently utilized my potential to work?
200 responses

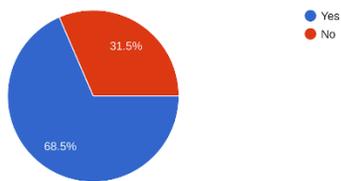


Figure 4: Efficient Potential Utilization

The organization I work for can improve upon efficiently utilizing my potential to work by:

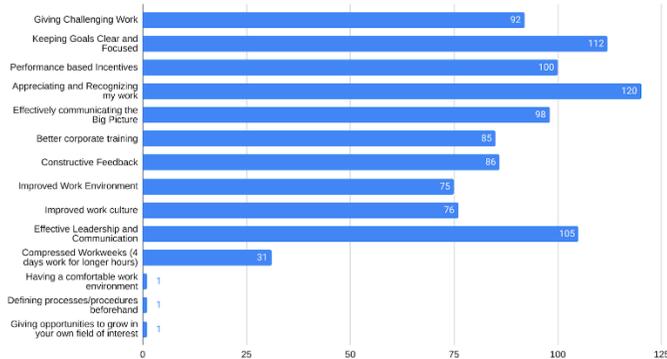


Figure 5: Improving the Efficient Utilization of Potential

"EFFECTIVELY" means DOING the RIGHT THING or being assigned the RIGHT GOALS to have the perfect job fit. The organization I work for has effectively utilized my potential to work?
200 responses

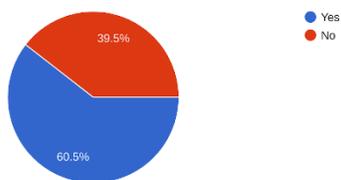


Figure 6: Effective Potential Utilization

The organization I work for can improve upon effectively utilizing my potential to work by:

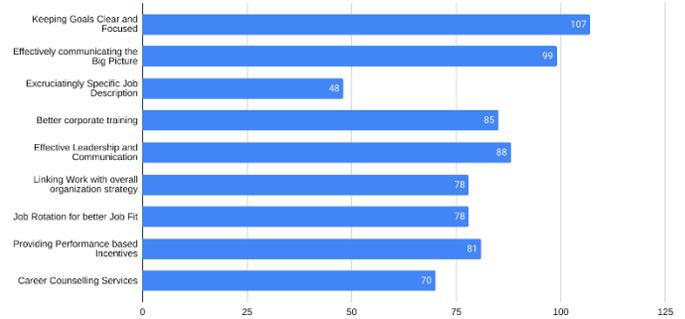


Figure 7: Improving the Effective Utilization of Potential

The effectiveness of Corporate Training in achieving a better Job performance (WORK MORE EFFICIENTLY & EFFECTIVELY) is:
200 responses

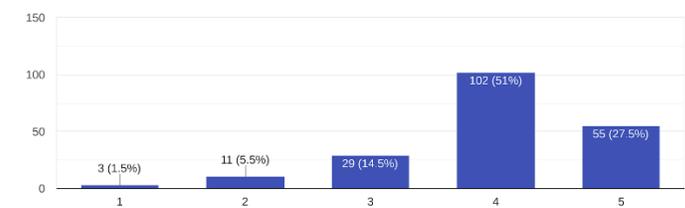


Figure 8: Effectiveness of Corporate Training

Characteristics that can make Corporate Training more effective:

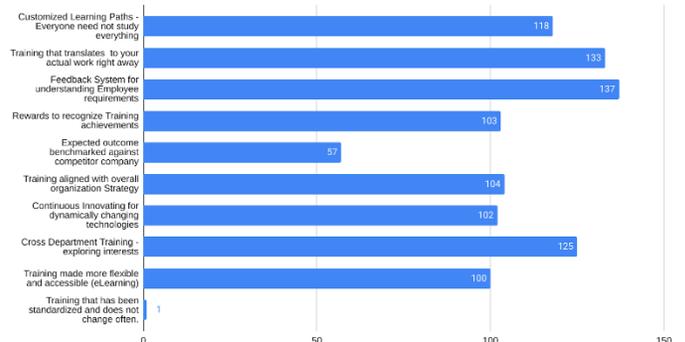


Figure 9: Characteristics of Effective Corporate Training

V. PROPOSED SOLUTION

The proposed solution is a synergy of tested approaches from different organizations and their successful approaches. Necessary references to the source of proposed solutions are specified wherever necessary. For understandability, the proposed solutions are structured into the different dimensions of Human Resource Management as HR Strategy, Recruitment and Selection, Training and Development, Performance Management, Employee Compensation and Benefits and Employee Engagement.

1. HR Strategy

Define High performance: Employees should be aware of what it means to be a high performer to achieve high performance. (research data)

Stakeholder Communication: Link Strategy to performance and communicate strategy. Stakeholders must be aware of the overall organizational strategy from the initial stage of Human Resource Planning.^[9] (*Strategic Planning for Dummies*)

Strategic Goal Setting: Goal setting at individual, team, department and organizational level to link goals to overall organizational strategy.

2. Recruitment and Selection

Toyota Way of Hiring: The Toyota way of hiring is an extensive way of recruiting employees which lasts up to 12 hours at times. The process includes a 2-5hr computer assessment followed by a 6-8hr work simulation following which the candidate will undergo F2F interviews. The extensive process ensures that only candidates with a perfect or nearly perfect job fit are recruited.

Methodical Hiring Process: Design Job Descriptions that are excruciatingly specific. Objective design of JDs will quantify the tasks an employee needs to perform to achieve high performance.^[10]

3. Training and Development

Robust Feedback System: Based on the research data collated, Corporate Training with a constructive feedback system that caters to Employee Requirements alongside Business requirements.

Trained to Work: Based on the research data collated, corporate training should be translatable to actual work post-corporate training completion ensuring that the Knowledge, skills and abilities (KSAs) gained from training will have the maximum impact on employee potential.

Culture of Learning: 94% of the employees say they'd stay longer in companies as per LinkedIn Workplace Learning Report 2020. Learning and Development is a motivator to employees towards better performance and effective potential utilization. Create a culture of learning.^[11]

Personalized Learning: Based on the research data collated, a personalized learning experience ensures the effectiveness of Corporate Training. As per LinkedIn Workplace Learning Report 2020, 80% of Gen-Z, 79% of Millennials, 78% of Gen-X and 77% of Baby boomers of the total surveyed opt for personalized learning recommendations for their respective career growths.^[11]

4. Performance Management

Dynamic Work Recognition: Based on the research data collated, a dynamic system for employee work recognition and appreciation can ensure the efficient utilization of employee potential.

Expect More: Google's approach to effective employee potential is to expect more. When more is expected from employees, employees are motivated to give it their maximum effort.^[10]

Reserve Budget: Effective utilization of employee potential comes with the correct job fit. Ensure a reserved budget to accommodate job rotation to get the best job fit.^[10]

High Power Microscope: High performers under a microscope to understand how high performance is achieved. High performer best practices can then be implemented across the organization.^[10]

Clear and Focused Goals: Based on the research data collated, clear and focused goals can ensure employees achieve maximum performance with little or no ambiguity in tasks performed.

Strategically Relevant: Each employee receives one or more strategically relevant objectives for the upcoming year. Measure the potential of employees based on strategically important objectives and their completion. Performance appraisal of employees based on strategically relevant goals will ensure the potential utilization of employees towards organizational strategy.^[12]

The Why: From Simon Sinek's model for high performance, employees driven by a cause rather than consequences of the cause fruition are motivated towards high performance.^[13] For instance, at Google, Googlers meet the people they help with the projects they work on.^[10]

5. Employee Compensation

Unfair Pay: Pay high performers unfairly. Unfair pay to high performers motivates maximum potential utilization.

Netflix Compensations: A competitive pay plan strategy, following the Netflix approach, with Internal Analysis and External Analysis (Competitor Market analysis) aligning pay with Silicon Valley competitors ensures above market standards pay and motivates high performance.^[12]

Strategically Linked: Following the strategically relevant goal setting in Performance Management, link strategic goals with pay to motivate employees towards high performance in achieving goals of strategic importance.^[12]

Free-rider effect: Avoid the free-rider effect with individual incentives included as part of group incentives to ensure high performers do not resign due to unfair pay.

6. Employee Engagement

Scanlon and Rucker plan: Scanlon plan is a gain-sharing approach based on employee engagement. Employees will exercise self-direction and self-control if they are committed to company objectives and will accept and seek out responsibility given the opportunity. Employees share the profit based on performance. Rucker Plan is similar to the Scanlon plan but measures productivity in terms of value-added.^[14]

Employee Recognition Systems: Based on the research data collated, employee recognition is at the forefront of achieving high performance and maximizing employee potential utilization. Google's gThanks and outstanding performance awards^[10], "Thank you Cards" as part of KIA motors employee engagement strategy are a few industrial best practices.^[12]

Hogan Development Survey: HDS can be used to find critical blind spots that affect or interfere with the high performance of employees. HDS can be used to identify the negative traits of employees that can affect their careers. Hogan Development surveying can help address such traits and prevent performance derailment.^[15]

HR Dimensions					
HR Strategy	Recruitment & Selection	Training & Development	Performance Management	Employee Compensation & Benefits	Employee Engagement
Define High Performance	Toyota Way of Hiring	Robust Feedback System	Dynamic Work Recognition	Unfair Pay	Scanlon and Rucker Plan
Stakeholder Communication	Hiring Methodical	Culture of Learning	Expect More	Performance-Based Pay	Employee Recognition Systems
Strategic Goal Setting		Personalized Learning	Reserve Budget	Netflix Compensations	Hogan Development Survey
			High Power Microscope	Strategically Linked	
			Clear and Focused Goals	Free-Rider Effect	
			Strategically Relevant		
			The Why		

Figure 10: Proposed Solution

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Workshop Tools Management Techniques Needed For Sustaining Quality Vocational Education In Technical Colleges In Rivers State

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DOI: 10.29322/IJSRP.10.09.2020.p10519
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10519>

Abstract- The study examined workshop tools management techniques needed for sustaining quality vocational education in technical colleges in Rivers State. Three research questions and three hypotheses were raised and formulated respectively to guide the study. A descriptive survey research design was adopted. The population for the study was 120; which comprised 72 technical teachers and 48 workshop attendants in four technical colleges in Rivers State. A stratified random sampling technique was used in selecting a sample size of 70; comprising 36 technical teachers and 24 workshop attendants. A 15 item structured questionnaire was used as instrument for data collection and the items were based on four points rating scale. The instrument was validated by three experts from the department of technical education of Ignatius Ajuru University of Education Ndele campus Rivers State. Cronbach Alpha method was used to establish the reliability of the instrument; which yielded reliability co-efficient of .81. Data was analyzed using mean and standard deviation for answering the research questions while the hypotheses were tested using z-test at the alpha level of .05 significance. The study reveal that planning, organizing and coordinating were workshop tools management techniques needed for sustaining quality vocational education in technical colleges. It recommended among others things that proper and accurate inventory and cataloging of workshop tools should be adopted in all technical colleges in Rivers State.

Index Terms- Workshop Tools, management techniques, Quality Vocational Education, Technical colleges.

I. INTRODUCTION

Education has been described as bedrock of national building and sustainable development (FRN, 2014). The quest for mass and qualitative education has become a concern to Nigerians as the world strives to achieve major breakthrough in the field of science and technology. The genesis of quality education is the development of quality educational programmes; which requires the expert knowledge of efficient and well-qualified curriculum planners (Nwakanma & Justus, 2013). In planning such programmes, Okon (2016) stated that the curriculum planners should not only specify the qualifications of curriculum implementers and supervisors but should also specify

infrastructures needed to sustain the quality of such educational programmes.

The curriculum of vocational education according to Federal Republic of Nigeria in her National Policy on Education (FRN, 2014) is aimed at providing relevant skills for employment. Vocational education is a comprehensive term referring to those aspects of the educational processes involving, in addition to general education, the study of technologies and related sciences and the acquisition of skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life (Aina, 2017). Vocational education according to Okoye and Okwelle (2014) provides the foundation for productive and satisfying career by offering the learner thorough and specialized preparation for paid or self-employment via its broad training programmes which offers broad knowledge and generic skills applicable to a number of occupation within a given field. One of the goals of vocational education as contained in the National Policy on Education (2014) is to give training and impart the necessary skills to individuals who shall be self-reliant economically. Similarly, the National Teachers' Institute (NTI, 2016) defined vocational education as the type of education that involves the use of the right instructional devices, methods, techniques and knowledge for developing skills.

In Nigeria, the teaching of vocational skills in the formal sector exists in two types of institutions (Oziegbe, 2016). These institutions are Technical colleges and Trade centres. Technical colleges in Nigeria are established to produce craftsmen at the craft level and master craftsmen at the advance craft level. The courses offered at the technical colleges lead to the award of National Technical certificate (NTC) and Advance National Certificate (ANTC). The curriculum of technical colleges according Federal Republic of Nigeria (NPE, 2014), are grouped into related trades. These trades include: computer trades, electrical/electronics trades, building trades and mechanical trades. The trades in this group include agricultural implement and equipment, mechanics work, Auto-electrical work, Auto-mechanics works, Auto-body building, Auto-parts merchandising, Metal technology, Mechanical Engineering craft practice, Welding and Fabrication Engineering craft practice, Foundry craft practice, Instruments Mechanics work and Refrigeration Mechanics works.

The objectives and content of the curricula of vocational education in technical colleges according to Marjor-Ritta (2016)

are derived from occupational standards or more directly from analysis of the task that are to be carried out on the job. These objectives can be achieved not only through a curriculum that is relevant and comprehensive but also through well-equipped workshops and training facilities. Workshop serves as a training ground for students to acquire relevant skills in their field of occupations. Workshop refers to a room or building where tools and machines are kept and used for making or repairing things (Okala, 2015).

Workshop tools are very important to the successful implementation of quality vocational education. These tools include: saws, planers, vices, drills, screw drivers, spanners, hammers, pointers, chisels, head pen, shovels, spades, spirit levels, lines, tapes, trowels, hand gloves, testers, multi-meters, cutters, among others. The availability and utilization of workshop tools has a major influence on the selection of teaching methods and materials (Barky, 2015). Uzoagulu (2016) affirmed that the utilization of workshop tools enhances students' skill acquisition during workshop practice. The use of workshop tools provides a platform for the students to experiment, study, imagine, create, design, construct, dismantle, repair and build equipment (Sulaimen, 2017).

The availability and utilization of workshop tools depends much on management techniques that are implemented in the workshops. Management according to Nwosu (2014) is the process that involves some activities like planning, organizing, coordinating, controlling in order to use available resources to advance a desired outcome in the fastest and most efficient way. Adesina (2014) saw management as the organization and mobilization of all human and material resources in a particular system to the achievement of identified objectives in the system using appropriate techniques.

Technique is the method of carrying out activities expertly in order to maximize profits and increase efficiency. Technique is a particular way of doing things especially one in which an individual has to learn a special skill (Aim, 2017). By implication, workshop tools management techniques include planning, organizing, coordinating, and controlling available workshop tools for effective and efficient usage. The applications of those skills are sometime influenced by prevailing circumstances existing in a certain place.

Students and workshop attendants of technical colleges in rural areas do not practice workshop tools management techniques unlike those in urban areas. (Idike, 2014). However, Okadara, (2014) was of the view that Students and workshop attendants of technical colleges in both urban and rural areas do not practice workshop tools management techniques. The study will seek to find out if location could influence choice of workshop tools management techniques in technical colleges in Rivers State.

I.I Statement of the Problem

Effective teaching and learning of vocational skills in technical colleges require the availability, functionality and utilization of workshop tools. Without workshop tools, vocational teachers are handicapped and cannot go far in the use of demonstration method of teaching. The state of workshop tools in technical colleges leave a lot to be desired. The attitudes and lifestyles of teachers, students and workshop attendants have caused a lot of problems ranging from wastage of materials or

consumables, and discriminate loss and damage of tools (Nwakanma, 2016). It was also observed that only few tools were available and functional; hence, students were compelled to carry out workshop practice in groups due lack of adequate tools (Ozoagulu, 2015).

This ugly trend if not urgently checked could result to graduating students that lack adequate vocational and management skills needed for employment. Therefore, what is the workshop tools management techniques needed for sustaining quality vocational education in technical colleges in Rivers State. This study seeks to find the answer.

I.II Purpose of the Study

The main purpose of the study was to determine workshop tools management techniques needed for sustaining quality vocational education in Rivers State. Specifically, the study will determine;

1. Planning techniques needed for workshop tools management in technical colleges in Rivers State.
2. Organizing techniques needed for workshop tools management in technical colleges in Rivers State .
3. Coordinating techniques needed for workshop tools management in technical colleges in Rivers State.

I.III Research Questions

The following research questions guided the study:

1. What are the planning techniques needed for workshop tools management in technical colleges in Rivers State?
2. What are the organizing techniques needed for workshop tools management in technical colleges in Rivers State?
3. What are the coordinating techniques needed for workshop tools management in technical colleges in Rivers State?

I.IV Hypothesis

The following null hypotheses were postulated and tested at .05 level of significance.

1. Workshop attendants in rural and urban areas do not differ significantly in their mean rating on the planning techniques needed for workshop tools management in technical colleges
2. Teachers and workshop attendants do not differ significantly in their mean rating on the organizing techniques needed for workshop tools management in technical colleges.
3. Teachers and workshop attendants do not differ significantly in their mean rating on the coordinating techniques needed for workshop tools management in technical college.

II. METHODS

This study adopted descriptive survey design. The population for the study consists of 120; 72 technical teachers and 48 workshop attendants in all the four technical colleges in Rivers State. A proportionate stratified random sampling was used to draw a sample size of 70; 46 technical teachers (23 in technical colleges in rural areas and 23 in technical colleges in urban areas) and 24 workshop attendants (12 in technical colleges in rural areas

and 12 in technical colleges in urban areas). Data were collected through the use of a structured questionnaire titled WorkshopToolsManagementTechniquesNeededforSustainingQualityVocationalEducation (WTMNSQVE). It was validated by three experts in the Department of Technical Education, Ignatius Ajuru University of Education, Port Harcourt. The questionnaire has 15 items in three cluster according to the research questions. It was structured on four-point rating scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). Reliability of the instrument was established through a trial test involving 9 technical teachers and 6 workshop attendants in Bayelsa State who were not part of the study population. Cronbach Alpha was used to determine the internal consistency of the instrument which yielded an overall reliability coefficient of 0.81 (0.81 in the first cluster of research questions, 0.83 in the second, and 0.79 in the third). Seventy copies of the questionnaires were distributed and retrieved from teachers and workshop attendants in Four Technical colleges in Rivers State in four different days by the researcher. There was a hundred percent retrieval of the questionnaires.

The data collected were analyzed using mean and standard deviation to answer the research questions and determine the

homogeneity or otherwise of the respondents views. For the research questions, real limit of numbers was applied thus: 0.4-1.4 for Strongly Disagree, 1.5-2.4 for Disagree, 2.5-3.4 for Agree and 3.5-4.4 for Strongly Agree. Decision on the research questions was based on the cluster mean relative to the real limit of numbers. z-test was used to test the hypotheses at .05 level of significance. A null hypothesis was accepted where the calculated z-value is less than the critical z-value. This means that there is no significant difference and the hypothesis will not be rejected. Conversely, where the calculated z-value is equal to or greater than the critical z-value, it means that there is significant difference and the hypothesis will be rejected.

III. RESULT

Results of the study were presented in the tables below.

Research Question 1: What are the planning techniques needed for workshop tools management in technical colleges in Rivers State?

Table 1:
Mean Rating and Standard Deviation of the respondents on Planning Techniques Needed for Workshop Tools Management in Technical Colleges. N=70

S/N	Planning Techniques	Mean	SD	Remark
1.	Selection of appropriate tools	3.62	0.58	SA
2.	Procurement of selected tools	3.64	0.57	SA
3.	Provision of storage facilities	3.17	1.04	A
4.	Provision of inventory forms	3.38	0.84	A
5.	Provision of cataloger	3.10	0.98	A
	Cluster Mean	3.38		A

Key: N= Number of Respondents;SD = Standard Deviation.

Data in Table 1 show that the mean of the items ranged from 3.10 – 3.64 while the cluster mean for the groups was 3.38. This means that respondents agreed that planning techniques are needed for workshop tool management in technical colleges in Rivers State. The standard deviations for all items were within the same range indicating that the respondents were not wide apart in their views. This means that selection of appropriate tools, procurement of selected tools, provision of storage facilities,

provision of inventory forms and provision of cataloger are needed for workshop tool management in technical colleges in Rivers State.

Research Question 2: What are the organizing techniques needed for workshop tools management in technical colleges in Rivers State?

Table 2:
Mean Rating and Standard Deviation of the respondents on Organizing Techniques Needed for Workshop Tools Management in Technical Colleges. N=70

S/N	Organizing Techniques	Mean	SD	Remark
1.	Proper issuance of tools	3.52	0.82	SA
2.	Proper retrieval of tools	3.36	0.76	A
3.	Taking of inventory of tools	3.55	0.82	SA
4.	Replacement of damaged and lost tools	3.64	0.68	SA
5.	Ensuring of safety of tools	3.50	0.82	SA
	Cluster Mean	3.51		SA

Key: N= Number of Respondents;SD = Standard Deviation.

Data in Table 2 indicates that the mean of the items ranged from 3.36 – 3.64 while the cluster mean for the groups was 3.51. This means that respondents strongly agreed that organizing techniques are needed for workshop tool management in technical colleges in Rivers State. The standard deviations for all items were within the same range indicating that the respondents were not wide apart in their views. This indicates that proper issuance of tools, proper retrieval of tools, taking of inventory of tools,

replacement of damaged and lost tools and ensuring of safety of tools are organizing techniques needed for workshop tool management in technical colleges in Rivers State

Research Question 3:What are the coordinating techniques needed for workshop tools management in technical colleges in Rivers State?

Table 3:
Mean Rating and Standard Deviation of the respondents on coordinating Techniques Needed for Workshop Tools Management in Technical Colleges. N=70

S/N	Coordinating Techniques	Mean	SD	Remark
1.	Organizing tools in their sizes and shapes	3.33	0.87	A
2.	Grouping tools in their field of use	3.59	0.58	SA
3.	Storing tools in their appropriate locations	3.33	0.92	A
4.	Keeping tools clean and dry	3.45	0.79	A
5.	Cataloging of tools	3.90	0.41	SA
Cluster Mean		3.52		SA

Key: N= Number of Respondents;SD = Standard Deviation.

Data in Table 3 indicates that the mean of the items ranged from 3.33 – 3.90 while the cluster mean for the groups was 3.52. This means that respondents strongly agreed that coordinating techniques are needed for workshop tool management in technical colleges in Rivers State. The standard deviations for all items were within the same range indicating that the respondents were not wide apart in their views. This shows that organizing tools in their sizes and shapes , grouping tools in their field of use, storing tools

in their appropriate locations, keeping tools clean and dry and cataloging of tools are coordinating techniques needed for workshop tool management in Rivers State.

Hypothesis 1:Workshop attendants in rural and urban areas do not differ significantly in their mean rating on the planning techniques needed for workshop tools management in technical colleges

Table 5
z-test Comparison of the Mean rating of Workshop Attendants in Rural and Urban Areas on Planning Techniques Needed for Workshop Tools Management in Technical Colleges.

Workshop Attendants	N	\bar{X}	SD	Df	Standard Error	z-cal	z-critical	decision
Rural	12	3.58	0.66	22	0.818	0.57	1.71	No Significant
Urban	12	3.38	0.81					

Table 5 shows that workshop attendants in rural and urban areas do not differ significantly in their mean rating on planning techniques needed for workshop tools management in technical colleges. This is because the calculated z-ratio of 0.57 is less than the critical value of z-ratio of 1.71. The null hypothesis is hereby not rejected.

Hypothesis 2:Teachers and workshop attendants do not differ significantly in their mean rating on the organizing techniques needed for workshop tools management in technical colleges.

Table 6
z-test Comparison of the Mean rating of Teachers and Workshop Attendants on the Organizing Techniques Needed for Workshop Tools Management in Technical Colleges.

Respondents	N	\bar{X}	SD	df	Standard Error	z-cal	z-critical	decision
Teachers	46	3.51	0.78	68	0.058	0.55	1.64	No Significant
Workshop Attendants	24	3.64	0.87					

Data from Table 6 reveals that the calculated value of z-ratio (0.55) is less than the critical value of z-ratio (1.64); the null hypothesis is not rejected. This implies that teachers and workshop attendants do not differ significantly in their mean rating on organizing techniques needed for workshop tools management in technical colleges.

Hypothesis 3: Teachers and workshop attendants will not differ significantly in their mean rating on the coordinating techniques needed for workshop tools management in technical college.

Table 7
z-test Comparison of the Mean rating of Teachers and Workshop Attendants on the Coordinating Techniques Needed for Workshop Tools Management in Technical Colleges.

Respondents	N	\bar{X}	SD	df	Standard Error	z-cal	z-critical	decision
Teachers	46	3.52	0.71	68	0.226	0.52	1.64	No Significant
Workshop Attendants.	24	3.63	0.77					

Table 7 indicates that, the calculated value of z-ratio (0.52) is less than the critical value of z-ratio (1.64); the null hypothesis is hereby not rejected. Its implication is that teachers and workshop attendants did not differ significantly in their mean rating on coordinating techniques needed for workshop tools management in technical colleges.

organizing techniques identified in the study include Proper issuance of tools, proper retrieval of tools, taking of inventory of tools replacement of damaged and lost tools and ensuring of safety of tools. This is supported by the findings of Ezech (2014) who stated that organizing technique such as taking inventory enhances workshop tools management. Also, the result of hypothesis on Table 5 revealed that there is no significant difference in the mean rating of teachers and workshop attendants on the organizing techniques needed for workshop tools management in technical colleges in Rivers State.

IV. DISCUSSION AND FINDINGS

The finding of the study revealed that planning techniques are needed for workshop tools management in technical colleges in Rivers State. The planning techniques needed for workshop tools management in technical colleges as shown in the result in Table 1 include selection of appropriate tools, procurement of selected tools, provision of storage facilities, provision of inventory forms, and provision of cataloger. This finding is in agreement with that of Okoli (2015) who stated that the provision of inventory forms for workshop attendants enhances workshop tool management. This is also in line with Osuala (2016) who identified lack of planning techniques as one of the specific reason for unavailability of workshop tools. There is no doubt that one of the threat to availability, functionality, and utilization of workshop tool is lack of planning techniques. Furthermore, the result of hypothesis revealed that there is no significant difference in the mean rating of respondents on the planning techniques needed for workshop tools management in technical colleges in Rivers State on the basis of location.

The finding presented on Table 3 indicates that teachers and workshop attendants generally agreed that coordinating techniques are needed for workshop tools management. Some of the coordinating techniques identified in the study include organizing tools in their sizes and shapes, grouping tools in their field of use, storing tools in their appropriate locations, keeping tools clean and dry and cataloging of tools. The respondents indicated that cataloging of workshop tools is essential as shown in the mean of 3.90 and standard deviation of 0.41. The finding is consistent with that of Esuh (2015) who stated that cataloging which an element coordinating techniques, is the best method of preventing loss of materials. The result on Table 6 reveals that, there is no significant difference in the mean rating of teachers and workshop attendants on the coordinating techniques needed for workshop tools management in technical colleges in Rivers State

The analysis presented on Table 2 also shows that respondents generally agreed that organizing techniques are need for workshop tool management in technical colleges. Some of

V. CONCLUSION

Based on the findings of the study, it was concluded that respondents agreed on the entire gamut of planning, organizing,

and coordinating techniques as needed for workshop tools management in technical colleges in Rivers State. Furthermore, cataloging of tools is importantly needed in workshop tools management. Location of technical colleges was found not to significantly influence the planning techniques needed for workshop tools management.

VI. RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made:

1. Qualified workshop attendants with management skills such as, planning, organizing, and coordinating should be employed by state government to manage technical colleges' workshops.
2. Retraining of technical teachers and workshop attendants in the technical colleges on those workshop tools management techniques should be organized by the State Ministry of Education.
3. State Ministry of Education, National Board for Technical Education (NBTE) and technical college heads should conduct seminars and workshops for students on those workshop tools management techniques.
4. Proper and accurate inventory and cataloging of workshop tools should be adopted in all technical colleges in Rivers State.

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Surface Modification and Characterization of Carbonized *Raphia taedigera* seed for the Adsorption of Pb^{2+} from aqueous solution

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DOI: 10.29322/IJSRP.10.09.2020.p10520

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10520>

Abstract- *Raphia taedigera* activated carbon was prepared and impregnated with sodium dodecyl sulphate (SDS) and disodium ethylene diaminetetraacetic acid (EDTA) to enhance its performance for the adsorption of lead ions from aqueous solution. The two modified activated carbons, the sodium dodecyl sulphate modified *Raphia taedigera* activated carbon (SDS-RT) and the disodium ethylene diaminetetraacetic acid *Raphia taedigera* activated carbon (EDTA-RT), were characterized. Fourier transform infrared spectroscopy revealed the presence of C=C, OH, CN and CO at peaks 1584, 3753, 2000 and 1240 cm^{-1} , respectively, which all aid adsorption. Scanning electron microscopy coupled with Energy dispersive X-ray showed an aggregated surface morphology with pores and the carbon-oxygen ratio of 3.54 and 2.39 for SDS-RT and EDTA, respectively. The optimum performances of 97.70% and 94.25% were achieved for the adsorption of Pb^{2+} onto SDS-RT and EDTA-RT, respectively; at pH 5 with 0.5 g using 25 mL of 100 mg/L lead ion solution. Material modified with SDS exhibited superior performances in all the adsorption conditions evaluated. Adsorption modelling showed the adsorption fit well into Langmuir isotherm model and follow the pseudo-second-order kinetic model. Thermodynamic studies showed that the adsorption processes are exothermic, feasible and spontaneous.

Index Terms- *Raphia taedigera*; Activated carbon; Adsorption; Lead.

I. INTRODUCTION

Heavy metal pollution is one of the prominent environmental issues of the present century. Due to the advancement in industrial activities such as smelting, metal plating, mining, paint, and metallurgical industries, more heavy metal pollutants are released into the environment [1]. Heavy metals such as lead, chromium, mercury, arsenic, nickel and copper find their ways into the water bodies through the indiscriminate discharge of industrial and agricultural waste. Heavy metal contamination can also occur through atmospheric deposition, metal corrosion, soil erosion and leaching of heavy metals, sediment re-suspension and metal evaporation from water resources to soil and groundwater [2, 3]. The presence and accumulation of heavy

metals in aquatic environments pose a significant threat to man, animal and plant [4].

Among the commonly encountered metal pollutants, lead is one of the most dangerous water pollutants. Lead toxicity has been a subject of interest for environmental researchers because of its toxic effect on plants, animals, and humans [5, 6]. Various industrial activities such as the extraction and processing of solid minerals, metal plating, oil refining, and battery manufacturing among others, had been recognized as the primary means of releasing lead into the environment [7]. Both Standard Organization of Nigeria and National Agency for Food and Drug Administration and Control set the maximum permissible limit of Pb in drinking water at 0.01 mg/L [8]. At higher concentration, serious health problems can occur. Lead toxicity poisoning in the human body can be devastating. Lead poisoning can cause anaemia, kidney damage, and toxicity symptoms including, impaired kidney function, headache and hypertension [9, 10]. Lead is highly persistent in the environment, and because of its continuous use, its levels rise in almost every country, posing serious threats. Several methods, including Fenton process, degradation by photocatalytic processes, chemical coagulation/flocculation, ozonation, oxidation, chemical precipitation, adsorption, ion exchange and reverse osmosis [11 – 14] had been used. Adsorption, among others, has proved to be an effective, cheap, simple and save technique for wastewater treatment [15]. Adsorption techniques use porous materials with large surface area and suitable surface chemistry. Materials such as clay, silica gel, activated carbon, synthetic resins, molecular sieve zeolites, impregnated biomaterials and nanoparticles have been extensively used as adsorbents for industrial applications in water and wastewater purifications [14]. Recently, agricultural waste products have found applications as biosorbents for adsorption process. Thus, this present work aims at using sodium dodecyl sulphate ($C_{12}H_{25}O_4S.Na$), and disodium ethylenediaminetetraacetic acid ($C_{10}H_{16}N_2Na_2O_8$) modified activated carbons prepared from *Raphia taedigera* seed for the removal of Pb ions from aqueous solution.

II. MATERIALS AND METHODS

Sample preparation

Raphia taedigera seeds were obtained from Ado-Ekiti. The seeds were washed under running water, sun-dried and crushed. The crushed sample was kept in an airtight plastic container for further analysis.

Preparation of *Raphia taedigera* adsorbent Carbonization

The carbonization of *R. taedigera* was done using method reported by Bello *et al.*, [16] and Olasehinde and Abegunde [15]. The crushed *R. taedigera* seeds were carbonized by placing 100 g of the seed in a muffle furnace at 350 °C for 2 hours.

Chemical activation of the carbonized material

The chemical activation was done on the carbonized material. 20 g of carbonized material was weighed and transferred into a clean 500 mL beaker containing 200 mL 0.1 M sodium dodecyl sulphate, homogenized and left to stand for 24 hours. The impregnated materials were filtered and the residue was rinsed with 200 mL distilled water to attain a pH of 7. The acid-free residue was dried to a constant weight at 105 °C for 4 hours [17]. The dried activated carbon was sieved with 100-mm mesh to obtain a fine powder of *Raphia taedigera* activated carbon labelled as SDS-RT. The procedure was repeated using disodium ethylenediaminetetraacetic acid as activating agent and the product labelled as EDTA-RT. The activated carbons were stored in a separate airtight container for further use.

Preparation of Pb (II) Solution

1000 mg/L of lead nitrate stock solution was prepared by dissolving 1.6 g Pb(NO₃)₂ in distilled water in 1000 mL volumetric flask and made up to the mark with distilled water. 0.1 M HCl and 0.1 M NaOH solutions were also prepared to adjust the solution pH. All reagents used were of pure analytical grade.

Batch Adsorption Studies and the Evaluation of Adsorption Condition

Batch adsorption studies were carried out by shaking 0.50 g of activated carbons (SDS-RT and EDTA-RT) separately with 25 mL of 100 mg/L Pb (II) solution in a 125 mL Erlenmeyer flask. The pH of the solution was adjusted using 0.1 M HCl or 0.1 M NaOH solution to 7. The flask was agitated at 120-rpm for 60 min to ensure equilibrium was reached. The solution was filtered with Whatman No 42 filter paper and the filtrate stored in the sample bottle. AAS was used to determine the concentration of Pb²⁺ in the filtrate. The quantity adsorbed by the ACs was determined using Equation 1. The efficiency of the adsorbent was determined using Equation 2. The effects of adsorption conditions such as contact time, solution pH, temperature, adsorbate concentration and adsorbent dosage were determined. This was done at constant conditions except the condition under examination. The quantity adsorbed and efficiency of the adsorbent were evaluated using Equations 1 and 2 respectively.

$$q_e = \frac{(C_o - C_e)V}{W} \quad (1)$$

$$\text{Adsorption efficiency} = \frac{(C_o - C_e)}{C_o} \times 100 \quad (2)$$

Where, q_e is the quantity of Pb²⁺ adsorbed per unit mass in mg/g, C_o is the initial Pb²⁺ concentration in mg/L, C_e is the Pb²⁺ concentration at equilibrium in mg/L, V is the volume of Pb²⁺ solution in millilitres and W is the mass of the adsorbent in grams.

Material Characterisation

The functional groups in the activated carbon were determined using Agilent Cary 630 FTIR instrument with scanning range 4000 – 650 cm⁻¹. The surface morphology examination of the prepared materials was carried out by Phenom ProX SEM at HV value of 15 KV coupled with EDX.

Adsorption Isotherm

Isotherm predicts the relationship between adsorbent and adsorbate [18]. It explains how adsorbent materials interact with pollutants. The results of this present work are modelled by Langmuir and Freundlich isotherm models.

Langmuir Isotherm

Langmuir isotherm is based on the assumption that maximum adsorption corresponds to a saturated monolayer of solute molecules on the adsorbent surface, that the energy of adsorption is constant, and that there is no transmigration of adsorbate in the plane of the surface [19].

Langmuir isotherm model can be expressed as;

$$q_e = \frac{q_{max}bC_e}{1 + K_L C_e} \quad (3)$$

The linear expression of this isotherm can be written as Equation 4

$$\frac{C_e}{q_e} = \frac{1}{K_L q_m} + \frac{C_e}{q_m} \quad (4)$$

Where q_e and q_{max} are the equilibrium and the maximum amount of the metal per unit weight of the adsorbent respectively, C_e is the residual metal concentration at equilibrium (mg/L), and K_L is a constant related to the affinity of the binding sites.

The shape of this isotherm can also be expressed in terms of separation factor (R_L) [20], which is given as follows:

$$R_L = \frac{1}{1 + K_L C_o} \quad (5)$$

Where K_L (L/mg) is Langmuir constant and C_o is the initial MB concentration in mg/L.

Freundlich isotherm

The Freundlich isotherm assumes adsorption takes place on a heterogeneous surface with a non-uniform distribution of heat of biosorption through a multilayer adsorption mechanism [17]. It is expressed by Equation 6.

$$q_e = K_f C_e^{1/n} \quad (6)$$

The logarithmic form of the Equation becomes:

$$\log q_e = \log K_f + \frac{1}{n} \log C_e \quad (7)$$

Where q_e is the equilibrium amount adsorbed (mg/g), C_e the equilibrium concentration of the adsorbate (mg/L), K_f and n are Freundlich constants.

Kinetic Isotherm

The adsorption kinetics in wastewater treatment is significant as it provides valuable insights into the reaction pathways and the mechanism of an adsorption reaction [15]. Pseudo-first-order and pseudo-second-order kinetic models are used for the present work.

Pseudo-first-order kinetic model

Pseudo - first-order kinetic model assumes that the overall adsorption rate is directly proportional to the driving force, that is, the difference between initial and equilibrium concentration of the adsorbate, $(q_{eq} - q_t)$ [21]. Therefore, the pseudo-first-order kinetic can be expressed in linearized form as Equation 7.

$$\log(q_{eq} - q_t) = \log(q_{eq} - \frac{k_1 t}{2.303}) \quad (8)$$

Where q_{eq} is the amount of Pb^{2+} adsorbed at equilibrium (mg/g), q_t is the amount of Pb^{2+} adsorbed at time t (mg/g); k_1 is the equilibrium rate constant of pseudo-first sorption (min^{-1}).

A straight line plot of $\log(q_e - q_t)$ versus t suggest the applicability of this kinetic model.

Pseudo-second-order kinetic model

The pseudo-second-order reaction kinetics model is based on the sorption equilibrium capacity. The linearized form can be expressed as:

$$\frac{t}{q_t} = \frac{1}{k_2 q_e^2} + \frac{1}{q_e} t \quad (9)$$

Where, q_t is the amount of Pb^{2+} adsorbed at time t (mg/g); k_2 is the equilibrium rate constant for the pseudo-second- order adsorption (g/mg/min).

A plot of t/q_t versus t should give a straight line of pseudo-second-order kinetics where q_e and k_2 can be determined from the slope and intercept of the plot, respectively.

Thermodynamic Studies

The values of the thermodynamic parameters such as a change in free energy (ΔG^0), enthalpy (ΔH^0) and entropy (ΔS^0) help to have a better understanding of the temperature effect on

the adsorption [17, 21]. The thermodynamic parameters can be evaluated using Equation 10:

$$K_c = \frac{C_s}{C_e} \quad (10)$$

Where C_s is the metal ions concentration on the ACs at equilibrium in mg/g, C_e is the equilibrium concentration of the metal ions in a solution in mg/L, and K_c is the thermodynamic equilibrium constant.

The Gibbs free energy, ΔG^0 (kJ/mol) for the adsorption metal onto the adsorbents can be calculated using Equation 11:

$$\Delta G^0 = -RT \ln K_c \quad (11)$$

Enthalpy and entropy are obtained using Van't Hoff's Equation [21]:

$$\Delta G^0 = \Delta H^0 - T\Delta S^0 \quad (12)$$

$$\ln K_c = \frac{\Delta S^0}{R} - \frac{\Delta H^0}{RT} \quad (13)$$

Where T is the absolute temperature (K), R is the universal gas constant (8.314 J/mol/k), ΔH^0 is changed in enthalpy, and ΔS^0 is the degree of disorderliness of a reaction.

III. RESULT AND DISCUSSION

FTIR Spectral analysis

FTIR analysis was done to know the functional groups in activated carbons. The spectral for SDS-RT and EDTA-RT were presented in Figures 1 and 2, respectively. The spectral revealed the presence of a band at about 3753 cm^{-1} corresponding to free OH group, a band at about 2000 cm^{-1} corresponding to stretching vibration of $-C\equiv N$, a band at 1584 cm^{-1} corresponding to stretching vibration of aromatic $C=C$, a band at 1240 cm^{-1} corresponding to stretching vibration of carboxyl group $C=O$. However, Figure 1 revealed the presence of a band at about 2877 cm^{-1} corresponding to Aliphatic C-H group, a band at about 1423 cm^{-1} corresponding to $=C-H$ bending vibration alkane which were not present in Figure 2. The difference in the FTIR spectral of the materials may be due to the different chemical used for surface modifications during the production process [22]. A similar result was reported by Olasehinde and Abegunde [15].

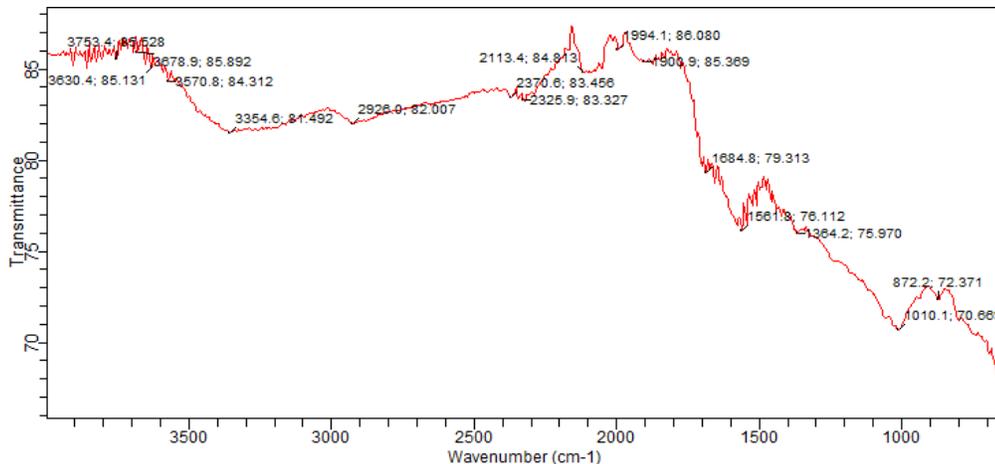


Figure 1: FTIR Spectrum of SDS-RT

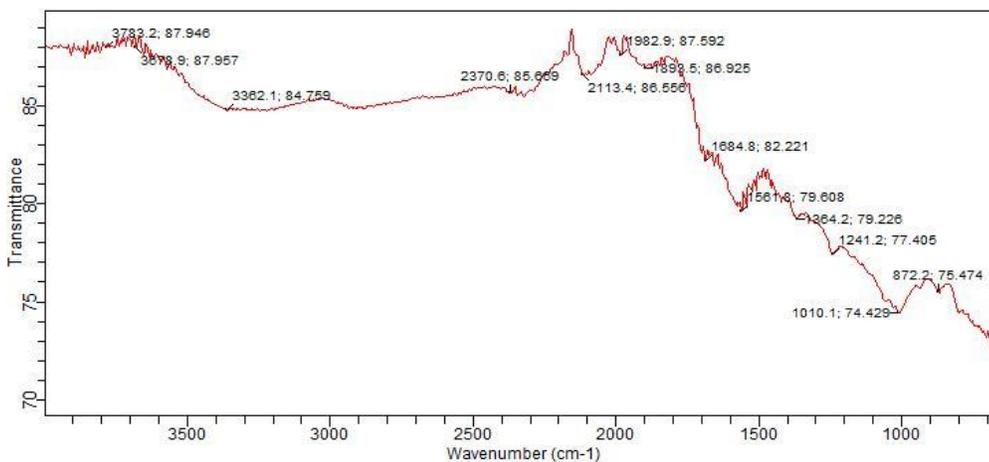


Figure 2: FTIR Spectrum of EDTA-RT

SEM Result

The surface morphologies of the SDS-RT and EDTA-RT were observed using scanning electron microscope. The micrographs at magnification 500x are presented in Figures 3 and 4. The SEM revealed an aggregated and rough surface morphology with pores at the surfaces of the ACs. Semi-quantitative chemical elemental analysis was conducted using EDX coupled with SEM. The detector allows the detection of elements such as C and O. EDX results of SDS-RT and EDTA-

RT presented in Figures 3 and 4. The figures revealed the ratio of carbon to oxygen (C/O) in the two samples as 3.54 and 2.39 for SDS-RT and EDTA-RT, respectively. The high ratio of carbon to oxygen can be due to pyrolysis and chemicals used for surface modification. Sample rich in carbon content is a good and effective adsorbent for the removal of heavy metals, dyes and other organic pollutants from an aqueous solution [23]. This result was in agreement with previous reports by Bello *et al.*, [16].

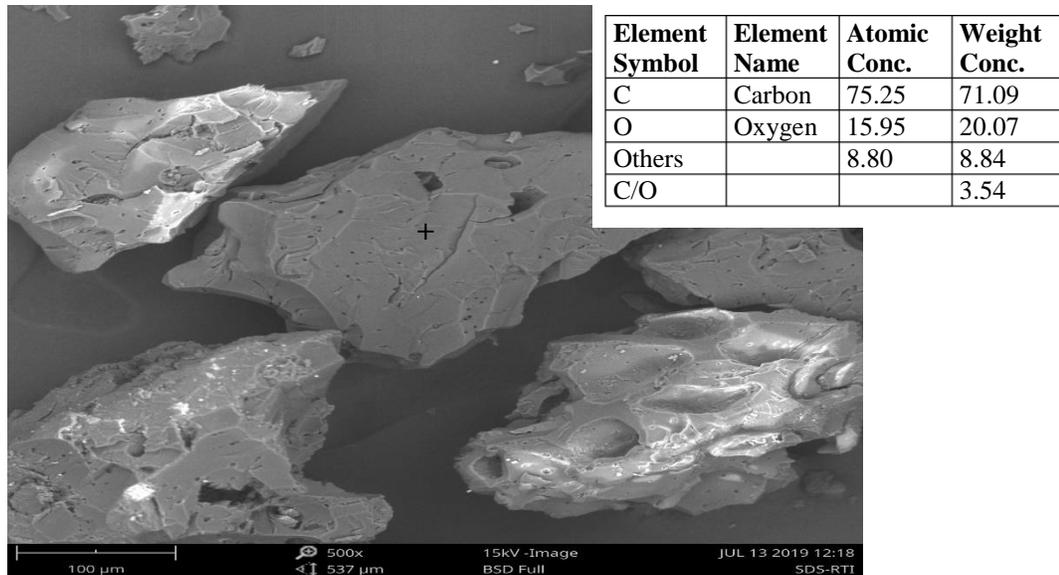


Figure 3: SEM image of SDS-RT with EDX

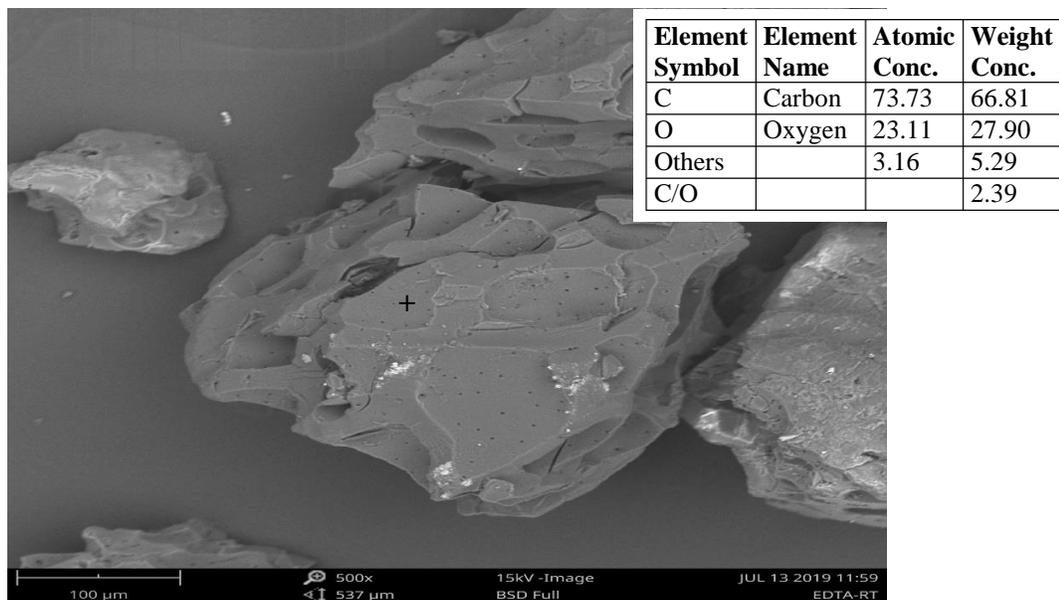


Figure 4: SEM image of EDTA-RT with EDX

Effect of Parameters in Adsorption Experiments

Effect of Contact Time

Equilibrium time is used to evaluate the efficiency and feasibility of an adsorbent. The adsorbent-adsorbate equilibrium time was evaluated at the time range of 10, 30, 60, 90 and 120 min using 100 mg/L Pb^{2+} on 0.5 g adsorbent, agitated at 120-rpm at room temperature. The plot of efficiency percentage against time is presented in Figure 5. From the plots, it was observed that the efficiencies of SDS-RT and EDTA-RT increased with increasing contact time. The highest performance of 98.663 and 97.001% obtained for SDS-RT and EDTA-RT respectively at 120 min. The rapid adsorption at the initial stage could be as a

result of the availability of abundant vacant sites on the surfaces of the adsorbents [22]. The responses of the adsorbents to time were in accordance with previous reports by AbdulRahman *et al.*, [10, 24]

Effect of pH

The pH of an aqueous solution is an important controlling factor that influences the uptake of the adsorbate. The pH influences the surface charge of the adsorbent particle and the degree of the ionization and speciation of the adsorbate. The effect of pH on the adsorption was experimented using 0.5 g AC, in 60 min with 25 mL of 100 mg/L Pb^{2+} agitated at 120-rpm. The pH of the solution was adjusted using 0.1 M sulphuric acid or 0.1

M sodium hydroxide. The plots of percentage of Pb^{2+} removal by SDS-RT and EDTA-RT against pH are presented in Figure 6. From the plots, the percentage removal increased with increasing pH until the pH maximum removal was attained at pH 5. for both SDS-RT and EDTA-RT. Low adsorption of Pb^{2+} at low pH is probably due to the presence of H^+ ions competing with the metal ions for the adsorption sites. This result supports that the adsorption depends significantly on the pH of the surrounding solution, which affects the adsorbent surface charge and the degree of ionization of the adsorbate [25].

Effect of Temperature

The temperature dependence of adsorption capacity of SDS-RT and EDTA-RT for the adsorption of Pb^{2+} was investigated. The evaluation was done at 298, 303, 308, 313 and 318 K on 0.5 g with 25 mL of 100 mg/L Pb^{2+} agitated at 120-rpm for 60 min. The plots of the adsorbent efficiency against temperature are presented in Figure 7. An increase in the percentage removal was observed up to 313 K for both ACs. The results showed the adsorption system could be exothermic which indicates that an increase in the temperature will result to an increase in desorption of the adsorbed Pb^{2+} . Similar result was reported by Sari *et al.*, [26].

Effect of Initial Concentration of Solution

The adsorbate concentration provides the needed driving force to overcome mass transfer resistance of the adsorbate

between aqueous and solid phase. The effect of initial concentrations was determined with the initial Pb^{2+} concentrations of 20, 40, 60, 80 and 100 mg/L onto 0.5 g AC agitated for 60 min. Figure 8 presented the responses of SDS-RT and EDTA-RT for the adsorption of Pb^{2+} . The percentage removal increased with increasing in initial concentration for two ACs. The observed percentage removal increase can be attributed to the driving force due to a higher initial concentration of the solution. This was in agreement with earlier reports that pollutant removal through the adsorption process is concentration-dependent [27].

Effect of Adsorbent Dosage

Adsorbent dosage is crucial to adsorption process because it provides the binding sites for the uptake of the pollutant from solution. The adsorbent surface chemistry determines the potential of the adsorbent to remove metal pollutants. The dosage effect of the ACs was evaluated for the removal of Pb^{2+} from aqueous solution using 0.1, 0.3, 0.5, 0.7 and 0.9 g of the ACs, 25 mL of 100 mg/L Pb^{2+} , at room temperature for 60 minutes. The plot of the percentage of removal against the ACs dosage was presented in Figure 9. The plot showed an increased in percentage removal with increase in the ACs dosage. The increase observed in the percentage removal by the two ACs could be due to the increase in the number of active sites at the surface because of the increase in the bulk of the adsorbents [25].

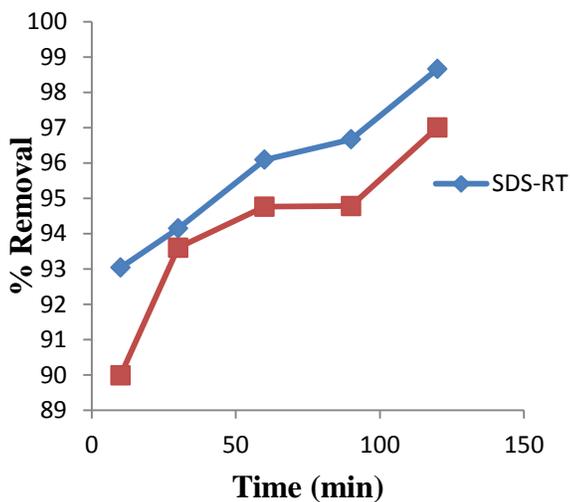


Figure 5: Effect of contact time

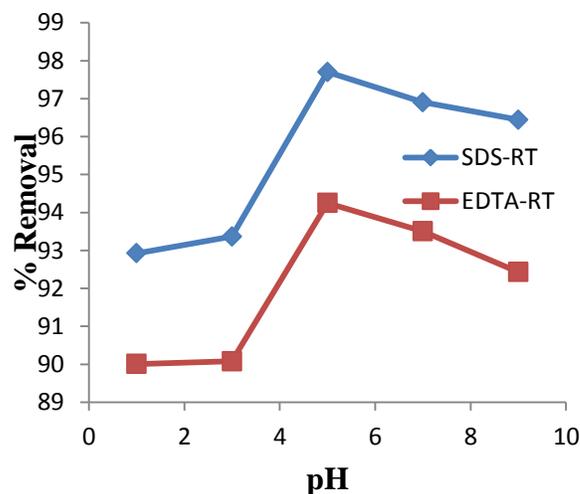


Figure 6: Effect of solution pH

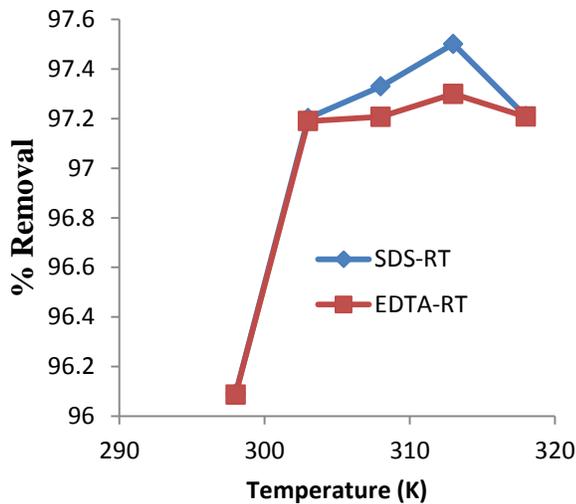


Figure 7: Effect of Temperature

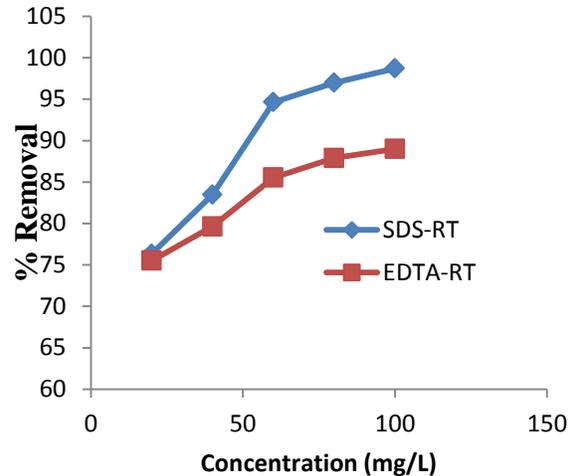


Figure 8: Effect of initial concentration

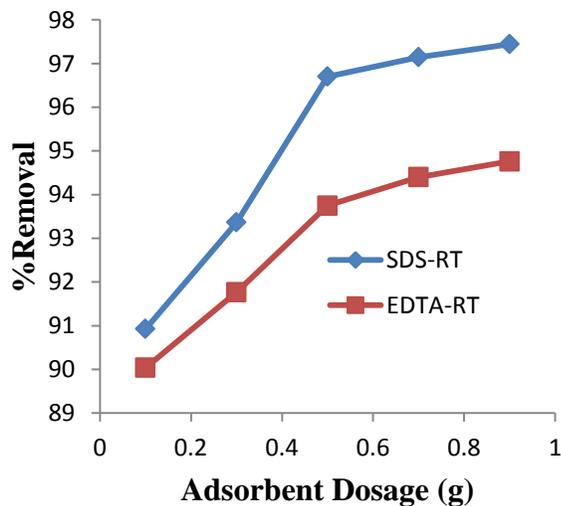


Figure 9: Effect of Adsorbent Dosage

Adsorption Isotherm

Adsorption isotherm explains the interaction between adsorbent and pollutants; hence, it is necessary to establish the most suitable correlation for the equilibrium curve. The adsorption isotherm models employed in this study are Langmuir and Freundlich adsorption isotherm models. Langmuir isotherm plots of C_e/q_e against C_e for the adsorption of Pb^{2+} onto SDS-RT and EDTA-RT at temperature values of 298, 308 and 318 K are presented in Figures 10 and 11, respectively. From the plots, the correlation coefficients (R^2) values equal to 1 for both ACs at all temperatures indicating a perfect relationship between the adsorption data. The values of q_{max} obtained from the Langmuir plots and the calculated q_e are presented in Table 1. The value of q_{max} was very close to its corresponding calculated value, q_e indicating Langmuir isotherm gives a good fit for the adsorption

of Pb^{2+} onto the adsorbents. Separation factor (R_L) was evaluated using Equation 5 to establish if the adsorption process is favourable or not. The R_L value determines the shape of the isotherm to be unfavourable ($R_L > 1$), linear ($R_L = 1$), favourable ($0 < R_L < 1$), or irreversible ($R_L = 0$). The values of separation factor (R_L) at all temperatures were greater than 0 and less than 1 for both ACs, indicating favourable adsorptions.

The Freundlich isotherm describes heterogeneous adsorption process. It assumes adsorption takes place on a heterogeneous surface with a non-uniform distribution of heat of biosorption through a multilayer adsorption mechanism (Rauf, 2008). Plots of $\log q_e$ against $\log C_e$ representing Freundlich isotherm are presented in Figures 12 and 13 for SDS-RT and EDTA-RT respectively. The correlation coefficients (R^2) from the plots are contained in Table 1. The correlation coefficients

(R^2) at all temperatures are > 0.97 , indicating a strong relationship between the adsorption data. The values of $1/n$ below 1 indicate a normal Langmuir isotherm. The results of the

adsorption isotherm model suggest Langmuir isotherm with a better conformation for the adsorption of Pb^{2+} onto SDS-RT and EDTA-RT.

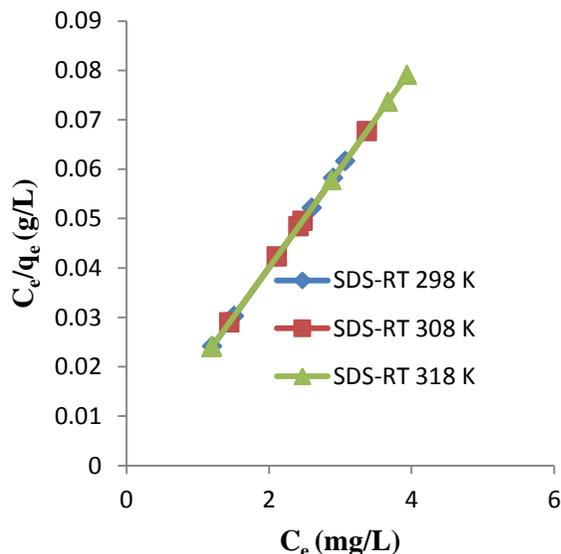


Figure 10: Langmuir isotherm plot for the adsorption of Pb^{2+} on SDS-RT

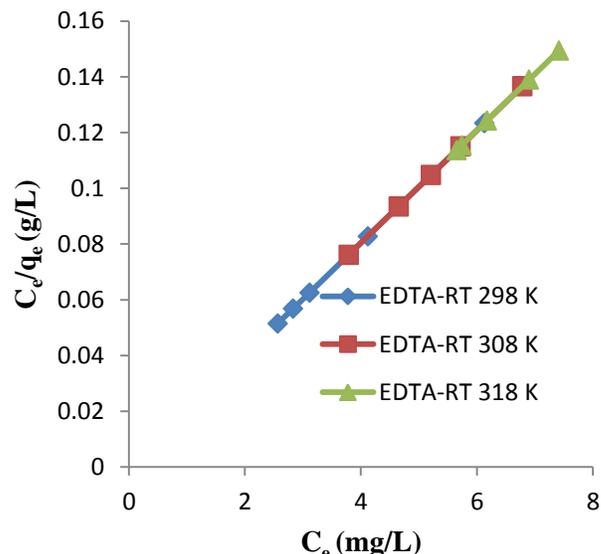


Figure 11: Langmuir isotherm plot for the adsorption of Pb^{2+} on EDTA-RT

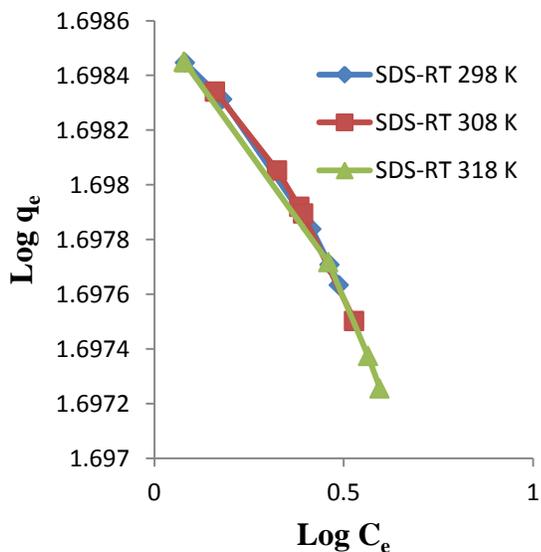


Figure 12: Freundlich isotherm plot for the adsorption of Pb^{2+} on SDS-RT

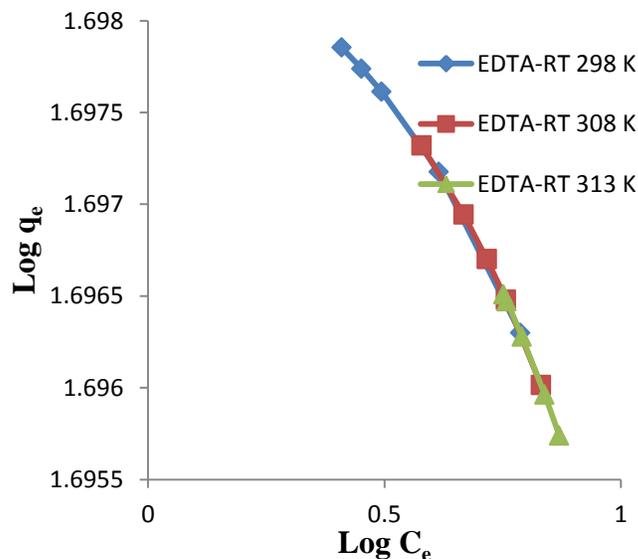


Figure 13: Freundlich isotherm plot for the adsorption of Pb^{2+} on EDTA-RT

Table 1: Results of adsorption isotherm for the adsorption of Pb²⁺ onto SDS-RT and EDTA-RT

Isotherms Equation	Parameters	SDS-RT			EDTA-RT		
		298 K	308 K	318 K	298	308 K	318 K
Langmuir $\frac{c_e}{q_e} = \frac{1}{KLq_m} + \frac{c_e}{q_m}$	Exp. q_m	49.75	49.75	49.75	49.51	49.51	49.26
	Cal. q_e (mg/g)	49.87	49.81	49.72	49.87	49.81	49.72
	K_L (L/mg)	251.26	201.01	201.01	67.34	40.40	25.38
	$R_L \times 10^{-5}$	0.04	0.05	0.05	0.15	0.25	0.39
	R^2	1.00	1.00	1.00	1.00	1.00	1.00
Freundlich $\log q_e = \log K_f + \frac{1}{n} \log C_e$	$-1/n \times 10^{-2}$	0.20	0.22	0.22	0.41	0.51	0.65
	$-N \times 10^2$	5.00	4.55	4.55	2.44	1.96	1.54
	K_f	49.96	49.97	49.96	50.07	50.15	50.28
	R^2	0.99	0.98	0.99	0.99	0.99	0.99

Adsorption Kinetics

Pseudo-first-order and the pseudo-second-order kinetic models were used to model the adsorption data in order to investigate the mechanism of adsorption of Pb²⁺ onto SDS-RT and EDTA-RT. These empirical mathematical models are proven useful as tools for scale-up process optimization [15]. A plot of $\log (q_{eq} - q_t)$ against t representing Pseudo-first-order kinetic model are presented in Figures 14 and 15. The values of the q_e , k_1 and R^2 obtained from the plots are presented in Table 2. The value of R^2 at all temperatures was greater than 0.7 but less than 1, indicating a strong relationship between the data. However, the calculated value of q_e was far below the corresponding experimental values; hence; the pseudo-first-order kinetic model cannot be said to be the best fit for the present work.

The Pseudo-second-order linearized Equation is expressed as given in Equation 9. The plots of t/qt against t for the kinetic

model are presented in Figure 16. The pseudo-second-order parameters q_e , k_2 and R^2 were calculated for the two adsorbents and presented in Table 2. The value of R^2 was found to be 1.000 at each temperature for both SDS-RT and EDTA-RT, indicating a perfect relationship between the adsorption data. Also, from Table 2, the value of $q_{e(cal)}$ was close to the corresponding $q_{e(exp)}$ value for the adsorption Pb²⁺ onto the two ACs.

The results of the kinetic modelling showed that the pseudo-second-order kinetic model has a better agreement with the adsorption data. The applicability of the pseudo-second-order model predicts that chemical reaction might be responsible for adsorption of Pb²⁺ onto SDS-RT and EDTA-RT. The results of similar findings have been reported for the adsorption of Pb²⁺ onto Onion skin [21].

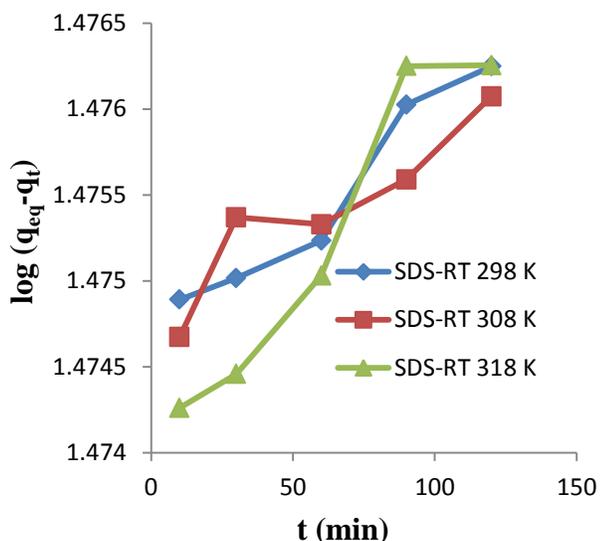


Figure 14: Plot of Pseudo-first-order Kinetic model for the adsorption of Pb²⁺ on SDS-RT

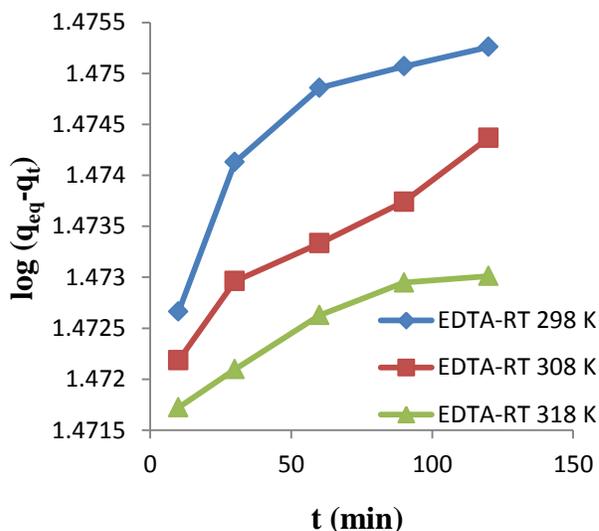


Figure 15: Plot of Pseudo-first-order Kinetic model for the adsorption of Pb²⁺ on EDTA-RT

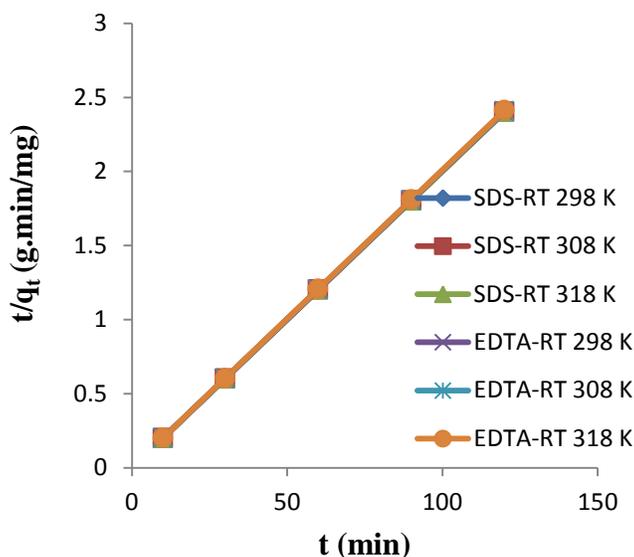


Figure 16: Plot of Pseudo-second-order Kinetic model for the adsorption of Pb²⁺ on SDS-RT and EDTA-RT

Table 2: Results of Adsorption Kinetics Parameters of the adsorption

Kinetic Model	Parameters	SDS-RT			EDTA-RT		
		298 K	308 K	318 K	298 K	308 K	318 K
Pseudo-first-order $\frac{1}{qt} = \frac{K_1}{q_e t} + \frac{1}{q_e}$	$q_e (mg/g)$	29.83	29.84	29.79	29.72	29.66	29.63
	$K_1 \times 10^{-3}$	0.02	0.02	0.05	0.05	0.05	0.02
	R^2	0.94	0.86	0.93	0.79	0.96	0.93
Pseudo- second-order $\frac{t}{qt} = \frac{1}{K_2 q_e^2} + \frac{1}{q_e} t$	$q_e (mg/g)$	50.00	50.00	50.00	50.00	49.75	49.75
	$K_2 (g/mg/min)$	0.40	0.57	0.29	0.40	0.34	0.58
	R^2	1.00	1.00	1.00	1.00	1.00	1.00

Thermodynamic Studies

The values of thermodynamic parameters such as Gibbs free energy change (ΔG), enthalpy change (ΔH) and entropy change (ΔS) are the real indicators for practical application of the adsorption technique. A plot of $\ln K_c$ against $1/T$ for the adsorption of Pb²⁺ onto SDS-RT and EDTA-RT is presented in Figure 17. The thermodynamic were determined and presented in Table 3. From Table 3, the values of ΔG and ΔH are negative,

while the value of ΔS is positive.. The negative values of the ΔG indicate spontaneous and feasible adsorption process. The negative value of ΔH° confirmed that the adsorption of Pb²⁺ onto SDS-RT and EDTA-RT were exothermic. The positive value of entropy indicates that the degrees of disorderliness increased at the AC-metal ion interface during the adsorption process predicting a low energy of attraction between the adsorbent and metal ions [15].

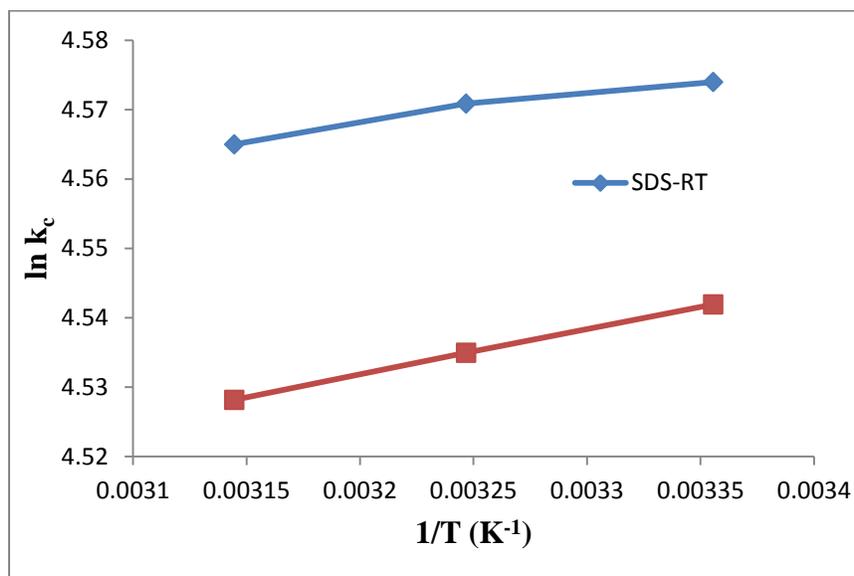


Figure 17: Thermodynamic parameters for the adsorption of Pb²⁺ on SDS-RT and EDTA-RT

Table 3: Thermodynamic parameters for the adsorption of Pb²⁺ on SDS-RT and EDTA-RT

Adsorbent	Temperature	ΔG^0 (KJ/mol)	ΔH^0 (KJ/mol)	ΔS^0 (J/mol/K)
SDS-RT	298 K	-11.33		
	308 K	-11.70	-0.35	36.85
	318 K	-12.07		
EDTA-RT	298 K	-11.25		
	308 K	-11.61	-0.54	35.94
	318 K	-11.97		

IV. CONCLUSION

Sodium dodecyl sulphate (SDS) and disodium ethylene diaminetetraacetic acid (EDTA) modified activated carbons were successfully prepared from *Raphia taedigera* seed. The two activated carbons showed the presence of some functional groups that are important for the adsorption of metal ions from aqueous solution. The carbon-oxygen ratio of 3.54 and 2.39 for SDS-RT and EDTA, respectively were calculated indicating the potentiality of material for adsorption process. The optimum performance of 97.70% was obtained for the adsorption of Pb²⁺ onto SDS-RT while the optimum performance of 94.25% was achieved for the adsorption of Pb²⁺ onto EDTA-RT at pH 5 with 0.5 g using 25 mL of 100 mg/L lead ion solution. Adsorption modelling showed the adsorption processes best fit into Langmuir isotherm model and follow the pseudo-second-order kinetic model. Thermodynamic studies showed that the adsorption processes are exothermic, feasible and spontaneous. The results of the present work showed that the sodium dodecyl sulphate (SDS) and disodium ethylene diaminetetraacetic acid (EDTA) modified activated carbons prepared from *Raphia taedigera* seed are good adsorbents for the removal of lead ions from aqueous solution.

Conflict of Interest: The authors declare that there is no conflict of interest.

ACKNOWLEDGEMENTS

The authors acknowledge the financial support of TETFund Nigeria and the Centre for Research, Innovation and Development, Federal Polytechnic, Ado-Ekiti.

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Effect of Corporate Governance Mechanisms on Environmental Reporting of Listed Companies in Nigeria: A Review of Literature

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DOI: 10.29322/IJSRP.10.09.2020.p10521

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10521>

Abstract: Corporate governance been a process and structure used to steer and control a company's business affairs targeted at enhancing business prosperity and corporate accountability with the sole aim of realizing long-term shareholder value not forgetting the interest of other stakeholders, is perceived to have an effect on environmental reporting of firms. This review studies the effect of corporate governance mechanisms on environmental reporting of listed companies in Nigeria. The core objective is to review conceptual and theoretical foundations as well as empirical literature relating to the effect of corporate governance mechanisms on environmental reporting of firms. Findings from the review shows that majority of the studies in this area made use of a short study period (one year) making it difficult to generalise the findings. Also, other studies used questionnaire to source data for this investigation not minding the fact that questionnaires are highly abused by some researchers. This review therefore recommends further research into this area to fill the gap in literature.

Keywords: Corporate Governance Mechanism, environmental reporting, stakeholders

1. Introduction

The objective of business corporations today is becoming greater than just creating goods and services, but among other things, making provision to address the environmental issues that arises due to the manufacturing of goods and services. It is evident that the operations of most companies pose serious environmental problems such as air, water and noise pollution, loss of biodiversity, global warming, and extreme weather conditions, among others. In a bid to balance these negative, adverse and challenging consequences of their operations, companies engage in other corporate responsibilities aimed at sustaining the environment.

Consequently, companies report their commitment towards environmental activities in various forms of media ranging from standalone environmental reports, triple bottom line reports, sustainability reports to annual reports (Sharifah, Bakhtiar, Nor, & Noor, 2011). The growing need for environmental reporting cannot be overemphasised. Environmental reporting may be defined as the systematic disclosure of environmental effects of a company's economic action to various stakeholders aimed at providing vital and realistic information of a company's operations and activities in an environment. Environmental disclosures most often includes information on materials, water, energy, biodiversity, emissions, effluents and waste, products and services, among others (GRI, 2011).

Environmental reports puts a company in a competitive advantage, attracts more customers and investors among other things. However, the voluntary nature of environmental disclosure has made it lacking in various company reports (Al-Janadi, Rahman, & Omar, 2012). The extent of disclosures on environmental activities now relies solely on the management of a company, who determine the manner and way in which these information are disclosed to the public.

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10521>

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Virtually all companies today have a mechanism termed corporate governance, through which their affairs are directed and controlled. This barely existed before the 1990s (Keasey, Short, & Wright, 2005). Corporate Governance basically entails the interaction among the participants (shareholders, company's management and board of directors) in moulding a company's performance and the efforts it is making towards achieving its stated goals. Corporate governance helps in guaranteeing that the business environment is fair and transparent and that companies can be held accountable for their actions. It is also important to note that, even though corporate governance emerged as a way of managing modern joint stock corporations, it is also valuable in managing cooperatives, family businesses as well as state-owned enterprises. Thus, only good governance can deliver sustainable good business performance regardless of the type of venture. Arising from the above, it is logical to state that good corporate governance is capable of influencing the level and extent of voluntary disclosures of financial and non-financial information of companies.

Engaging in activities aimed at sustaining the environment for the present generation and generations yet unborn and their corresponding disclosure is crucial for the survival of companies because, all companies have relationships with the society. By this, the society ensures their survival in the long run. The need to preserve the environment implies that the responsibilities of firms have gone beyond satisfying (providing money for the shareholders) fund providers to satisfying other stakeholders as well. This has bridged the information gap between the firm and its stakeholders. Firms nowadays strive to balance the needs of their stakeholders hence the need to sustain the environment and its associated disclosure.

Since it has become pertinent for firms to sustain the environment and report same, due care should be taken in financial reports since users of these reports rely on them for their decisions. Owing to the importance of these reports, if they are not elaborate and factual, decisions based on them may not yield the desired results hence the call for supervision and enforcement. Supervision and enforcement of environmental friendly policies and their associate disclosure requires corporate governance mechanisms. Corporate governance been a set of internal and external mechanisms that determine how and by whom the corporations are governed and how a proper and responsive information disclosure to stakeholders should be, is perceived to control the kind of environmental activities firms engage in and report. It is against this backdrop that this paper reviews extant written works on the outcome of corporate governance mechanisms on the environmental disclosure of listed companies in Nigeria.

2. Conceptual Clarification

This section discusses the concepts of corporate governance mechanism and environmental reporting.

2.1 Corporate Governance Mechanisms

Corporate governance is a concept with a great deal of attention worldwide in both the private and public sectors. It deals with the relationship between the internal governance mechanisms of corporations and the depth of corporate accountability. Adedotun (2003) views corporate governance as the framework for accounting for decision making. It is an effective management relationship within an entity's integrity to enhance its performance for the benefit of all stakeholders.

According to Claessens (2002), corporate governance is the process and structure used to direct and manage a company's business affairs targeted at enhancing business prosperity and corporate accountability with the sole aim of realizing long-term shareholder value not forgetting the interest of other stakeholders.

Corporate governance is a system that helps in directing and controlling an organization. It involves the relationships between the accountability of a company's stakeholders and the policies, laws, practices, procedures, principles and standards that may affect a company's direction and control (Ahmed, 2014).

Although corporate governance codes, regulations and practices may vary from country to country, Millstein Report 1998 posits that accountability, fairness, transparency and responsibility are the four core corporate governance principles. (Omolo, 2015). Fairness in this context connotes guaranteeing the safety of shareholder rights and the impartial treatment of all shareholders while transparency is the timely and quality release of sufficient, unambiguous and comparable information concerning corporate performance, governance and ownership. Accountability and responsibility is the obligation of the organization to account for its activities, accept responsibility for them and to show the results in a transparent manner.

There are many mechanisms through which corporate governance can be harnessed in every organization. Prominent among these mechanisms are board size, board independence, ownership concentration and board financial expertise.

2.1.1 Board size

It is the sum total of non-executive and executive directors on a company's board that ensure decisions reached by the management are to the advantage of the firm and minimizes the costs. This usually includes outside directors, executive and non-executive directors of a company. The board of directors with more than seven members is unlikely to be ineffective (Florackis, 2008). This is owing to the reality that a larger number of people with expertise and experience will tend to add more value to crucial decisions reached by companies than a board with a small number of persons on it ("two good heads are better than one"). It is required that

large board will be capable of maintaining independence from the board and thereby motivate management to divulge more information. Johari and Rahman (2008) gave proof that board size has a major influence on the extent of environmental reporting of companies. In the same vein, Yusoff, Darus and Rahman (2015) found a positive significant connection between board size and environmental reporting of firms. This means that, all things been equal, the larger the board size, the higher the level of environmental disclosure by firms.

Contrary, other studies maintained that sizeable boards are less effective than non-sizeable boards. Byard, Li and Weintrop (2006) in their study, stated a negative relationship between board size and disclosure. The study found that less financial disclosure is made as the board size increases. Cheng and Courtenay (2006) also indicated that board size has no relationship with voluntary disclosure. The reason for these negative results may be the difficulty of coordination that comes with managing a large group. This may negatively affect a large board in terms of decision making and may also transcend to ineffective monitoring.

2.1.2 Board independence

This is the level at which members of a company's board takes decisions regarding the company without interference from the 'powers that be'. It is evidenced by the number of non-executive directors to executive directors. Fama and Jensen (1983) posit that boards comprising of more independent directors ensure that stakeholders' interest is of utmost priority so as to maintain good reputation in society. The Cadbury Committee (1992) maintained that, there should always be a greater number of non-executive directors to executive directors on the board composition. In line with this position, boards with a reasonable number of non-executive directors can have a threshold on the application of managerial decisions by manipulating their monitoring ability and protecting their reputations as effective and independent decision makers (Ajiboladea and Uwuigbeb, 2013). Ienciu (2012) in his study also ascertained that board independence explains the rate at which companies disclose information regarding their environmental activities. In the same light, Mgbame and Onoyase (2015) maintained that, board independence and environmental reporting has a positive and significant relationship. Also, Naseer and Rashid (2018) found that, a board with more independent non-executive directors is associated with greater environmental reporting. It can be deduced from the above that a company with more non-executive on its board would have more individuals being spurred to protect their reputation through disclosure of material information including the environmental effect of their business activities, by promoting higher transparency.

2.1.3 Ownership concentration

Ownership concentration refers to the portion of shares held by institutional shareholders such as pension funds, banks, endowment funds insurance companies and mutual funds among others (Lakhal, 2005). Generally, it is believed that the effectiveness and efficacy of a board is reduced because of the presence of institutional investors. Jensen and Meckling (1976) maintained that separation of ownership and control increases the demand for information disclosure by firms. It can therefore be said that, institutional shareholding decreases the probability of enhanced corporate environmental reporting. Investors with larger stake in a company may confine the decision making power of the board. This can greatly reduce the board autonomy and activism (Lakhal, 2005). However, Jouirou and Chenguel (2014) found no material relationship between institutional ownership and reporting. However, Majeed, Aziz and Saleem (2015), Masud, Nurunnabi and Bae (2018) and Naseer and Rashid (2018) maintained that ownership concentration and institutional ownership positively affects CSR reporting of companies.

2.2. Environmental reporting

(CIMA, 2012) defines environmental reporting as the public disclosure of information concerning an entity's environmental performance that makes an organisation appear more accountable for the environmental consequences of their activities. Environmental reporting can also be defined as public disclosure by a firm of its environmental performance information, similar to the publication of its financial performance (Online Business Dictionary, 2010). To Beredugo and Mefor, (2012), environmental reporting is very important because it improves the quality of decision making. It necessitates firms to institute a standard and set reduction goals as well as realise the relevance of changing consumption and production patterns that are untenable, alongside protecting and managing Nigerian national resources; the information embedded in environmental reports are crucial for comparability, accountability and probity, hence when absent, the reports could be held as being fraudulent, bias, not transparent, and bound to risk which in turn could discourage patronages from suppliers, consumers, surrounding communities and investors. In developing countries, there are positive indicators of environmental reporting practices in firms and business organisations, however the practice is not strict enough, as there are no specialised activities in companies or factories to apply it or the planning of research to specifically target and define public, consumers or owners' needs, instead the practice is carried out haphazardly. (Beredugo and Mefor, 2012). Uwuigbe and Jimoh (2012) is in concord with the view that environmental reporting is not serious in developing countries e.g Nigeria. They stressed that, most companies in Nigeria majorly disclose information relating to consumers and products, community and employees participation but has very little data that can be measured, which in itself is insufficient.

2.3 Theoretical Framework

This section reviews agency, stakeholder and legitimacy theories in connection with the effect of corporate governance mechanisms on environmental reporting as seen thus.

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2.3.1 Agency theory

This theory was initiated by Jensen and Meckling (1976). It assumes that the determinant of the actions and decisions between two parties are members of a group. According to Jensen and Meckling (1976) an agent-principal relationship is a contract under which one or more persons (the principal/s) engage with another person (the agent) to render services on their behalf which includes delegating some authority to the agent to make decisions.

In monitoring the business operation and achieving the objectives and goals of the company as well as maximising the shareholders wealth, the manager is responsible for acting on behalf of their principal (shareholders). In a situation where the manager fails to put first the interest of the shareholders, agency conflict arises (Brennan, 1995). Thus, to avoid a violation of action by the manager against the shareholders, strict monitoring and control are needed to ensure that their (managers) efforts are directed at maximising shareholders' wealth (Halme and Huse, 1997).

As such, to control agency problems and ensure that managers act in the best interests of their shareholders, appropriate corporate governance mechanisms have been introduced (Ho and Wong, 2001). In the context of environmental issues, the board of directors, as an agent is concerned about developing good corporate environmental practices on behalf of their shareholders (principal). This is essential in creating a good image for the firm to some investors with a view to convincing them to invest with the company. In addition, exhibiting pleasant corporate environmental conduct may increase the company's reputation, command public respect (Halme and Huse, 1997) and a boost in shareholders' confidence in terms of the safety of their investment. Various managements have diverse opinions regarding environmental issues due to its cost implication (Buniamin et al., 2011). Hence, boards of directors institutes strange mechanisms to their needs, introducing tailor-made corporate environmental practices.

Managers have the opportunity to reduce information asymmetry regarding environmental concerns by voluntarily publishing environmental reports however, the voluntary setting implies that, there is room for opportunistic behavior for managers' not to publish negative (bad) sustainability information (Unerman et al., 2007). Hence, Friedman (2007) argues that engaging in corporate responsibility is symptomatic of an agency problem. There is a clash between the interests of managers (agent) and stakeholders (principal), because managers often use corporate responsibility to further their own social, political, or career agendas, at the expense of stakeholders that need a reliable representation of a firm's sustainability performance. To re-establish the interest of stakeholders', corporate governance mechanisms can be used. Higher levels of corporate governance pressure may urge companies to become more responsible for sustainability issues and report on them accordingly.

2.3.2 Stakeholder theory

The stakeholder theory was first championed by Freeman (1970). It holds that the aim of the firm is to create wealth or value for its stakeholders by exchanging their stakes into goods and services or to serve as a vehicle for coordinating stakeholder interests (Zhang, 2016). It centres on the relationship between a company and its behaviour within its external environment in the course of achieving organizational objectives (Hamidu, Haron, & Amran, 2015). Accordingly, the company ought to be managed for the benefit of its stakeholders (suppliers, owners, customers, employees and local communities) and to maintain the survival of the firm.

According to Freeman (1984) the stakeholder concept provides a new way of thinking about strategic management. By paying attention to strategic management, executives can begin to put a corporation back on the road to success. It is also a normative theory that requires management to have a moral duty to protect the corporation as a whole in connection with the legitimate interests of all stakeholders (Friedman, 1970). Evan and Freeman (1988) maintained that management (especially top management) must look after the health of the corporation. This involves balancing the diverse and contradictory interests of stakeholders. The term stakeholder was meant by Friedman (1970) to generalize the notion of stockholder as the only group to whom management need to be responsible to. Stakeholder can be taken in two senses. In a narrow sense, it includes the groups that are vital for the survival and success of the company (Freeman and Reed, 1983). In a wider sense, it includes any individual or group that can affect or is affected by the company (Freeman, 1984). Thus, stakeholders are known by their interests in the affairs of the company and it is assumed that the interests of all stakeholders have intrinsic value (Donaldson and Preston, 1995).

It is often assumed that environmental reporting influences the reputation of corporations from the instrumental stakeholder perspective, which is seen as an intangible asset of firms (Zhang, 2016). Simply put, companies align with the interests of stakeholders, such as public, government and customers concerning environmental issues and stakeholders in turn respond positively to companies that make significant efforts in sustaining their environment over companies who do not.

2.3.3 Legitimacy Theory

Legitimacy theory was first advocated by Dowling and Pfeffer (1975). The theory holds that organisations always ensure that their operations are within the bounds and norms of the respective societies they operate in. In adopting a legitimacy theory perspective, an organisation would voluntarily report on the activities its management perceive as been expected by the communities in which it operates. Legitimacy theory relies on the notion that there is a 'social contract' between a company and the society in which it operates (Deegan 2000; Deegan 2002; Mathew 1993; Patten 1991; 1992).

Legitimacy theory suggests that whenever managers consider the supply of a particular resource as vital to their organization's survival, they should pursue the strategies necessary to ensure the continued supply of the resource. Such strategies may include targeted disclosures, or perhaps, controlling or collaborating with other parties who in themselves are considered to be legitimate. Companies need to be fair in their environmental dealings and therefore, legitimacy theory provides disclosing approaches that organizations may apply to improve their existence in the most possible and best way.

Although all the three theories (agency, stakeholder and legitimacy) provide a logical clue regarding the effect of corporate governance mechanism on environmental reporting, this paper is hinged on agency theory. This is because managers as agents are saddled with the task of running a company, putting the interest of the shareholders (principals) as a topmost priority. Corporate governance mechanisms are instruments that ensure the overall interest of the company is upheld at all times. Since the practice and reporting of environmental issues, a managerial function is perceived to be beneficial to shareholders, corporate governance mechanisms are meant to ensure its realization and sustainability at all times.

[2.4 Empirical Studies

This review is structured based on the recency of the works. This is based to the fact that all things been equal, recent works are expected to be a step on older ones.

Aliyu (2019) investigated the relationship between corporate governance variables such as board independence, board size, risk management committee composition, board meeting (BM), and corporate environmental reporting in Nigeria. Data from the study is gotten from annual reports of 24 non-financial public listed companies in Nigeria Stock Exchange comprising natural resources, industrial goods and oil & gas sectors from 2011–2015. The study utilized panel data analysis and based on the Hausman test, the random effect model was used to examine the effect of predictors on CER. The result revealed a positive significant relationship between board independence and CER and a positive significant relationship between BM and CER.

Odoemelam and Okafor (2018), investigated the influence of corporate governance on environmental disclosure of nonfinancial firms listed on Nigeria Stock Exchange (NSE). Data relating to the study were obtained from 86 firms listed on Nigeria Stock Exchange (NSE) in 2015. Content analysis, cross-sectional data, OLS regression techniques were used to analyze the influence of board characteristics on the extent of overall environmental disclosure (OED). The result shows that board meeting, board independence and environmental committee were statistically significant while audit committee independence and board size were insignificant.

Masud, Nurunnabi and Bae (2018) assessed the effect of corporate governance (CG) elements on environmental sustainability reporting performance (ESRP) in South Asian (SA) countries. Data relating to the study were collected from 88 listed organizations from Bangladesh, India, and Pakistan, from 2009-2016 (8 years). OLS regression analysis technique was employed to analyse the data. Findings reveal that there is no association between ESRP and family ownership, female directorship, and CSR and environmental committees.

Sar (2018) examined the impact of corporate governance on sustainability performance. Data relating to the study were obtained from 122 companies selected from 159 companies listed in CMIE PROWESS through questionnaires. Board structure, disclosure, related party transactions, shareholder rights and board procedure were proxies for corporate governance. Data were analysed using correlations technique. Findings from the study revealed that companies with high corporate governance index are associated with superior sustainability performance.

Elshabasy (2018) assessed the impact of several corporate governance characteristics on environmental information disclosure of the listed firms in Egypt. Data were obtained from 45 most active firms listed on Egyptian stock exchange from 2007 to 2011. Data analysis was done using multiple regression analysis. Findings revealed that there is an insignificant relationship between two factors of firms' characteristics (Firm Size and Firm Financial Leverage) and environmental information disclosure (EID), while Firm's age showed a negative significant relationship with EID and finally Firm's Profitability showed a positive significant relationship with EID. The study employed data of both cross-sectional and time series in nature. However, the data analysis techniques employed, which is the OLS regression does not take cognisance of the cross-sectional nature of data.

Ofoegbu, Odoemelam and Okafor (2018) examined the influence of corporate board characteristics on environmental disclosure of quoted firms in South Africa and Nigeria. Data were obtained from annual reports of 303 environmentally sensitive companies selected from South Africa (213) and Nigeria (90), for the year 2015. Data was analysed using descriptive, multivariate, and

regression model. The study findings indicate a significant positive association between board independence and environmental disclosure in Nigeria. In South Africa, 45% of environmentally sensitive industries significantly influence environmental disclosure, while 51% of environmentally polluting industries in Nigeria show insignificant association with environmental disclosure. Data was collected for only one year as the study does not consider variations that may be envisaged over time.

Naseer and Rashid (2018) analysed the relationship between corporate governance characteristics and environmental reporting of firms in Pakistan. Data were obtained from the 50 non-financial companies listed on Pakistan Stock Exchange (PSX) for the a period of two years (2014–2015). A multifactor regression model consisting of six elements of corporate governance namely board independence, board size, audit committee independence, CEO duality, institutional investors and the proportion of female directors on board were used to assess the impact of CG on environmental reporting initiatives of companies. The results shows that higher proportion of independent non-executive directors on the board, larger board size, CEO and institutional ownership, partition of the dual role of chairman are associated with high environmental disclosures.

Sajid, Faqir and Abdul (2017) investigates the differential effects of corporate governance on CSR across small, medium, and large firms. The findings firmly supports the hypothesis that CG is not sufficient enough to compel firms disclose more about their corporate responsibilities. Rather, a combination of CG and ownership structure can induce firms' choice of CSR engagement. Specifically, the results suggest that CSR involvement decreases when insider ownership goes beyond the 50% level. Finally, the results shows that significant differences in the effects of CG and other underlying empirical determinants of CSR exist across firms as a result of their sizes.

Akbas (2016) analyzed the relationship between selected board characteristics and the depth of environmental disclosure by Turkish companies. The study made use of 62 non-financial firms quoted on the BIST-100 index as at 2011. Content analysis was deployed to measure the depth of environmental disclosure. Board independence, board size, audit committee independence, board gender diversity were used as independent variables that may affect the depth of environmental reporting of Turkish companies. The result reveals that, board size is statistically significant and positively related to the level of environmental disclosure. This result implies that firms with larger boards report more environmental issues than companies with smaller boards. Nevertheless, all the remaining independent variables were unrelated to environmental disclosure. This study was carried out in Turkey and data employed was for a single year as such, it may not be sufficient to generalise the results obtained.

Yusoff, Darus and Rahman (2015) examines the potential links between corporate governance mechanisms and environmental reporting practices from the perspective of agency theory. The study used content analysis to collate data from 100 leading Malaysian public-quoted companies from 2009-2011. Using regression analysis, the results shows an improvement in environmental reporting among the studied companies. Also, board size and environmental reporting are positively related while ownership concentration, board independence and female directorship were statistically not related to environmental reporting of firms.

Majeed, Aziz and Saleem (2015) investigates the potential effects of corporate governance elements on corporate social responsibility disclosure. The study made use of data from 2007-2011. Corporate governance elements such as independent directors, board size, women representation in the board and foreign nationalities, ownership concentration, firm size, institutional ownership and profitability. Using multiple regression technique, findings reveal a positive and significant impact of institutional ownership, board size, ownership firm size and concentration on CSR reporting. This study just like Yusoff, Darus and Rahman (2015), made use of data up to 2011 hence the need for another study that will utilise data up to 2019 to validate or prove otherwise the findings.

Mgbame and Onoyase (2015), examines the effect of corporate governance on environmental reporting. Using simple random sampling technique, 14 listed firms was used for the study. The study made use of board independence, board size, and audit committee independence as corporate governance variables. Using multiple regression analytical technique, the study found that board independence, board size, managerial ownership concentration and audit committee independence have positive and significant relationship with environmental reporting.

Setyawan and Kamilla (2015) investigated the impact of corporate governance on corporate environmental disclosure. The proxies for corporate governance used were size, gender proportion, ethnic background, frequency meetings of board of directors and education level. The GRI's checklist was used to obtain disclosure index. Content analysis was done on annual reports of Indonesian mining companies from 2011-2013. Using multiple regression to analyse the data, result revealed that corporate governance variables are insignificantly related to environmental disclosure except size and meeting frequency.

Ajiboladea and Uwuigbeb (2013) examined the effects of corporate governance (CG) mechanisms on corporate social and environmental disclosure (CSED) among firms quoted on Nigerian Stock Exchange. Forty firms were selected for the study using judgmental sampling technique. Content analysis was employed to collate data from 2006-2010. The study measured CSED using 50 items of information while CG mechanisms examined were Board size, CEO duality, audit size and proportion of nonexecutive directors. Data were analyzed using correlation and regression analysis. Findings shows a significant negative relationship between CSED and CEO duality; and significant positive relationships between board size, proportion of non- executive directors, audit size

and CSED. Although this study made use of data with panel attributes, techniques of data analysis which the researchers employed (OLS regression) did not take cognisance of the panel nature of the data.

2.5 Conclusion and Areas for Further Research

This review focus on the effect of corporate governance mechanisms on environmental reporting of firms. It is gathered that corporate governance mechanisms are instruments that ensures that the best interest of the company is upheld at all times. Since the practice and reporting of environmental issues (a managerial function) is seen as been beneficial to stakeholders, (shareholders, host communities, creditors, employees, government, public etc.) corporate governance mechanisms are meant to ensure its realization and sustainability at all times. From the empirical works reviewed, it is evident that majority of the studies made use of a relatively small sample size for this investigation. Although some of the studies made use of data with panel attributes, the technique of data analysis they employed (OLS regression) did not take cognisance of the panel nature of the data. To this end, more research can be carried out on this subject matter to address these issues.

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Microfinance Role in Providing Access to Finance for the Women in the Gambia

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DOI: 10.29322/IJSRP.10.09.2020.p10522

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10522>

Abstract:

The microfinance institutions in the Gambia came in to be as all other microfinance institution to ease access to finance for the poor especially the women, and close the gap that exists between the rich and the poor in accessing finance, this gap is allegedly believed to be created by the conventional Banks who neglected or not making much effort in reaching out to poor people. This paper is focuses on to assess the effort that microfinance institutions in the Gambia are doing to bridge this gap, the study concentrated on the leading microfinance institution in the Gambia called Reliance Financial Services (RFS), and its main product called women finance that concentrate on the women who are the most vulnerable to this problem (i.e. access to finance). This study uses a qualitative form of research and exploratory in nature. The findings indicates that microfinance institution were successful in reducing the gap that exists between the two sex when it comes to accessing finance. The study made the following recommendations; cutting down the interest rate, periodic training of both the officers and the group, putting proper monitoring scheme to determine those performing and those that are not, the need to restructure the program by bringing some small changes rather than keep it the same since inception, changing the payment period and the mode of payment.

Key Words: The Gambia, Microfinance institutions, Women, Access to finance.

1. Introduction:

The Gambia is among the smallest country in Africa; it is surrounded by the Republic of Senegal on its three sides and it is on the western part of the African. (Census & Results, 2013) indicated the population of the Gambia at 1.8 million. Gambia's GDP in 2016, was USD964 million and a gross national income per capita of USD430. Poverty in the Gambia manifests itself in the form of multiple ways where 53% of the population is food poor while 61% is categorize as absolute poor, of which 74% is in the rural areas. The rural population is overly dependent on agriculture as the single source of income generation for which they are poorly equipped and lack sufficient coping mechanisms (Of & Gambia, 2000). To solve this problem microfinance institution is doing very well in enabling the poor farmers and women to have easy access to finance in the Gambia, there are various microfinance institutions in the Gambia who are now providing a different kind of loan scheme to the poor farmer and women, but in this research, our concentration will be on women. microfinance institutions came up with loan schemes that is mend for only women so that they can also have equal opportunity in accessing finance, but the institution that initiated this revolution is Reliance financial services (RFS), and the product is call women finance, this product as the name implied is for only women, and now it is available all over the Gambia. Thus women in any part of the country can get access to this loan, the loan is now accessible in almost all the branches of RFS across the Gambia, and now women all over the country have access to finance through this women finance product. According to Dieter, (2000), Creating rural finance systems is not a solution to all the problems. Neither is it without its challenges, especially in developing countries, among them: assuring the participation of all stakeholders; building rural financial infrastructures that are diversified, according to local conditions, enhancing institutional sustainability with outreach to the poor; and fostering a conducive policy and regulatory environment. According to Weber & Ahmad, (2014) women often do not have access to finance by conventional banks and either depend on private lenders or on microfinance institutions their Lack of access to finance may be because women do not know how to access formal finance, they cannot provide the necessary collateral. and yet still they are the main contributors to the socio-economic development of many country and Gambia is no exception, evidence from the study by (Della-Giusta & Phillips, 2006) in the Gambia women are actively involved in many economic activities, such as soap making, tie and dye, sawing, pottery and small-scale agricultural activities, farming, gardening, petty trading locally call "Gende Njie" (meaning buy and sell) etc. According to Özkan, (2011) Many studies have revealed that women's contribution to family income of households in poverty has created important support. Also, the micro-credit system encourages women to create their jobs, as the GNP (Gross National Product) of the

countries contributing to increasing employment opportunities. According to Annan et al. (2012), Investing in women is key to development, they arguing that, making use of the contact with communities in the potential female workforce satisfactory for women to create job opportunities to gain income can provide initial capital to the existing banking system, because in many countries' negative socio-cultural conditions, competing with men is much difficult. The micro-credit system, in respect of changing countries' socio-cultural and socio-economic structures, is an important contribution. The program lunch by Reliance Financial Services become a game-changer, now women get access to finance easily in the Gambia, the women finance does not involve much paper work, and you do not need to provide any collateral, in a study of (James & Gary, 2004) Microcredit is most often offer without traditional collateral. If physical collateral were a requirement for borrowing, most MFI clients would be unable to participate due to their extreme poverty level. Because borrowers do not have physical capital, MFIs focus on using social collateral, through group lending. Group lending entails different methodologies, but all depend on the policy of joint liability. In a sense that, the groups takes the necessary control method, and enforcement of loan contracts from the lending institution Wenner, 1995. Under joint liability, each group member is made liable for the loans of other group members. If one member defaults, the other group members are required to cover the loan from their savings, and if they do not, they lose access to future loans. Therefore, in each member's interest to ensure that the other members pay. From 2014 to 2019 more than 30,000 women are benefiting from this loan scheme of Reliance financial services (RFS) and they are targeting to reach 100,000 women who could be the majority of women working population, according to (Census & Results, 2013) the population of the Gambia is at 1.8 million of which women population was 50.5 percent which is 0.9 million and that you have girls and old age.

2. Literature review:

This product of microcredit for women started in the Gambia by a company called Reliance Financial services in the year 2014, which is form and operate by the Gambian, it started the program in 2014, with only a few villages and communities in the UPPER REVER REGION and KOMBO, these communities are used for piloting to see whether the product will work effectively in the Gambia, after its been successful, the experts of the product made recommendation for expansion in subsequent years, and now this product is accessible in every region of the Gambia and is one of the best product of Reliance Financial services now, and other Micro Finance Institution (MFI) also came with a similar product. Evidence from the literature supports the suggestion that women are part of the missing links in the development challenges confronting the least developed economies; this is consistent with the findings of (Madichie & Nkamnebe, 2010). The extension of microfinance to Women for micro-enterprise development is one of the strategies for women empowerment (Kuumuori, Afriyie, & Yao, 2015). The idea of this women's finance product originated from Senegal in a place called Caurie MFI (Kaolack and Ziguinchor); this is where Reliance studied the product call "women Finance." The program operation is as follows; to access the Loans women are formed into groups, after that will be finance and the payment period is 6 months, and the payment is conduct on monthly bases, the 1st, 2^{an}, 4th, and 5th month are for interest payment and compulsory saving while the 3rd and the 6th months are for half principal and interest payment, if a cycle is complete another loan is disbursed, and now the amount to be received will be determine by your saving plus the pervious loan. However, delays in payment of half principal plus interest at 6th month often make it difficult for group members to start another loan cycle. No collateral was required, and a flat interest rate of 18% per loan cycle (of 6 months) was charged, which is spread for all the six months. The central feature of the program is the joint-liability which mean in the event a group member default all group member a liable for it, and they all have pay, or else they will not be finance.

The current development of Microfinance is as a result of the failure of the formal financial markets to include the poor as different and unique economic agents. This exclusion of poor resulted to the establishment of Grameen Bank by Mohammed Yunus In the early 1970s, Bank Rakyat Indonesia which became the most successful rural -mandate banks in the Asia -Pacific (Dieter & Schmidt, 2000), World Vision Ghana began operation in 1980 (Kuumuori et al., 2015) etc. micro-credit (MC) program is to provide small loans for poor people who lacked collateral. MC is a creative way to lend financial resources to the poor, by creating a network of trust where families, neighbors, friends, or even strangers come together to support each other financially. MC programs focus on the poorest of the poor, those that are deprive of formal financial markets opportunities (Barboza & Trejos, 2009). According to Syuhailah et al., (2015), women's access to finance, especially from conventional banks in developing countries, is an obstacle to poverty alleviation. In this regard, if we want to fight poverty, it is very important to equip women with entrepreneurial knowledge and skills together will microfinance assistance as a means for them to embark on small-scale business. Microfinance refers to an activity that aimed for a world in which low-income households have constant access to quality financial services to finance their income-generating activities, own assets, maintain consumption (Liheta, Aikaruwa, Lukas, & Sumari, 2013).

Microfinance fast increase in the number of theoretical and practical work obvious. In almost every part of the world, especially in developing countries and countries in lagging regions has the potential to create growth. The increasing significance of the subject and practices that create brilliant results in this field has led many academics to concentrate. Most empirical studies of this nature include various regions of the world as vital research and development of micro-credit subjects are qualifications that will allow comparison application (Özkan, 2011). According to (Breu, Guggenbichler, & Wollmann, 2008), the field of microfinance is less than 40 years old, yet it appears to have been remarkably effective in helping to eradicate poverty. It typically provides loans to individuals (mostly women) to establish or improve their businesses.

3. METHOD:

This study is design as qualitative research, involving the steps of identifying the potential women groups, how they are surveyed to determine their loan viability, and to enroll them in the program. This research also to conducted interviews with women`s and loan managers to identify relevant indicators of women access to finance. The research also used to gather data to assess the effectiveness of women`s finance programs in providing access to finance for the women in The Gambia. Finally, the research assessed to evaluate changes in women`s access to finance since the start of women finance program. The qualitative methods used in this research will generate rich, contextually detailed, and valid process data that left the participants` perspectives minimally change and enabled in-depth explanation of the topic. Because the majority of the women in this study cannot read and write to answer written questions, qualitative research using interviews is indeed a better option (Kuumuori et al., 2015).

3.1 Study setting and research participants:

Data collection is conducted in four Branch of RFS in three different regions of the Gambia the participant were some of the loan officer in the system who help me to get the data in the system. Interviews were conducted through a telephone conversations with the women loan recipient in the different regions, and also questioners were sent to some of the women and loan officers who also help to interview women in the field. All 100 participants who were interviewed, 95 were women and the remaining five was loan officers of Reliance Financial Services. The age of the women were between 18-60 years. The majority of the women had no formal education. Majority of these women are in polygamous marriage. The majority of the women also had between one and five surviving children. In comparison with Gambia 2003 Population and Housing Census data, the socio-demographic characteristics of our study participants were generally very typical of the women population in the region (Census & Results, 2013). We chose Reliance Financial Services simply because they are the biggest microfinance institution and also they have a specific product called women finance, which is mended for only women. We chose the three regions because two of the region (North Bank Region and West Coast Region) were the place where the program was pilot, and the other region was chose to determine how expand the women finance program is in the Gambia now.

3.2 Sampling procedures:

The strategy for selecting participants involved both probability and nonprobability sampling procedures. For the women, a simple random sampling procedure is use to select participants, it involved a three-stage procedure. First, we obtained the individual files containing names and personal records of each of the women loan recipients from the four branches under study. In the second stage of the sampling, we made a person to randomly select the required number of participants from the pool of files for each branch. Third, we then contacted each of the randomly selected persons in their various branches list to conduct interviews. Where ever the selected participant could not make it for the interview we replace it with other members. A purposive sampling technique is use to select staff of Reliance Financial Services, it was a judgmental selection based on the participant`s perceived role or knowledge of the product of study.

3.3 Data collection methods:

In-depth interviews with individuals were employed to collect data. It was supported with the development of a structured instrument to collect detailed demographic and socio-economic organizational information about the participants. Twenty in-depth interviews were conducted and were done in various groups from different communities of the selected groups. All interviews was conducted in the local dialect of the communities. Each interview lasted for 10-15 min. In all groups, participants` discussions was recorded.

3.4 Research instruments:

Instruments were used for in-depth interviews through telephone calls and audio recordings. This instrument allowed questioning to be easy while permitting us to analyze more in-depth on certain pertinent issues. These instruments focused primarily on documenting how this women finance program provide access to finance for the women, and the impact it has on their life. And for the loan officers, the women who are literal Google questioners were used, some of the questions explored include: how did you become a member of Reliance Financial Services women finance scheme? Did you decide by yourself? Before you received the credit, were you engaged in any economic activity that generated income? Do you have any cash savings or disposable income that you could use to make small purchases on your own? Presently, do you have any cash savings or disposable income on your own? What did you do with the loan you received? Are you making a profit from any investments that you made with the loan? Do you think this loan scheme provides access to fiancé for women? What are your difficulties loan scheme? The following are questions that was asked to the loan officers: how many women groups you are managing? What is the total number of women under your management? What is their repayment rate? What is the default rate? What impact does the loan have on the lives of the women? Does the program improve the life of women? Did your loan portfolio increase or decrease? Why increase or decrease?

3.5 Analysis:

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10522>

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Following the completion of interviews, Data Analysis occurred in three stages. First, interview transcripts were reviewed several times, searching for recurring regularities. We highlighted quotes and phrases from the interviews that were significant to the study. Using the constant comparative method (Heath & Cowley, 2004), we went back and forth among transcripts until categories emerged that were consistent, yet distinct. Second, we brought together the coded interviews and field notes and looked for relationships within and across the data sources. A table is develop to compare various coded interviews. Finally, we integrated and refined the categories until themes solidified.

4. FINDINGS AND DISCUSSION:

4.1 Targeting women

We start the presentation of our research by briefly explaining why women are the targets of RFS in this loan scheme. The official policy position of RFS for targeting women with credit is to provide them access to finance because they feel like women are not consider in term accessing finance, and to eradicate poverty women need to be empowering through the provision of microcredit which would enhance their productive capacity because they are the key players in the socio-economic activities in the Gambia and yet still a majority of them are unemployed, and they formed the majority of the population of the Gambia (Summary et al., n.d.). They believed targeting women is further founded on the assumption that women's bigger contribution to family welfare. The argument here is that the priority of women is always their children, then subsequently accompanied by spending on their household necessities. RFS, therefore, believes providing women with credit to increase their income would generate more direct transformational benefits to family welfare.

Notwithstanding, interviews with loan officers suggest other hidden agendas that directly raise questions about the truthfulness of the loan scheme targeting the women. According to some of the loan officers, many times they are ask with this question from the male counterpart, why this loan is targeting only women? And their response to this question is that male is not trustworthy with this kind of credit whenever you give them a loan they always divert it into other users, and when its due for payment they will be defaulted, in most cases in the Gambia, the male takes care of the household needs so when a male are given loan instead of investing they will just spend on household need and when the payment comes, they will be default. But for women, they feel ashamed of taken loan in their fellow women present and being unable to pay when due, so for them whenever they got the loan they will invest it wisely and it will generate income for them, and payment they will try all means possible to pay, in short from the explanation of some loan officer is that women are more reliable in repaying loan than their male counterpart. That's why they work with them.

The motive of targeting women, apart from it being seen as the best thing to do, is also a strategic one, meant to facilitate easy recovery of loans. But RFS's method also indicates a vital lesson about how poorly implemented microcredit methodologies applied without enough knowledge of the socio-cultural context can lead to unexpected, adverse consequences, even while achieving some better outcomes. Therefor having good understanding of the nature of potential loan recipients and the socio-cultural context within which they live could be relevant for the survival, effectiveness, and long-term success of any microcredit program.

4.2 Amount, sufficiency and period of the loan scheme:

Table1: shows the length of time respondents had benefited from the scheme and the amount of loan received. Most of the women (73%) we interviewed had been in the program for more than two years. In an earlier study in Bangladesh (Hashemi, Schuler, & Riley, 1996) Grameen Bank have focused their programs increasingly on women, and have attempted to draw women out of isolation mainly by providing them with access to finance which will improve their economic opportunities. Our discussions and in-depth interviews with women revealed the fact that the coming of the women finance program, provide access to finance for the women in the Gambia, and indeed improve their economic opportunity, the women reported. Because the ability to be finance empowered depended on other more important factors such as the type of investment the loan is put into and whether a woman even had control over the loan use and the income. From the time the loan scheme was lunch till the time of this research, most women had received a cumulative loan amount of between D5, 000 and D25, 000. While Reliance Financial Services considered the various amounts it loaned to women were appropriate for women to access finance and be empowered, our interviews with women regarding the accessibility of the loan (92%) believed the loan scheme provides access to finance to engage in any meaningful income-generating activity.

Table 1: Amount, Sufficiency, and period of the loan.

Characteristics	Response	Percent
No of cycle		

1-4	26	27%
5-8	31	33%
8-10	38	40%
Amount received (D)		
5000-10000	35	37%
11000-16000	48	50%
17000-25000	12	13%

The study identifies a problem which some of the women raised with regards to the time of loan repayment, the concern they raised with regards to the time was that the time of capital repayment is too short when they invest the loan before it pay any dividend or generates any income, the loan officers will come for half capital payment, because the period of the loan is six months and a half capital is pay at the third month while the other half is pay at the sixth month. About 35% raised their concern with regard to the period of payment. And the other complained of which majority raised was about the time of disbursement of the loan, about 57% raised their concern with regards to the timing of disbursing money, because they said they take the loan to invest and make a profit so the best time they will prefer to be given loan is during fest time such as Eid in Muslim calendar, charismas, because according to them during these period businesses work very well, so therefore if they are financed during these periods that will help them in term of generating income for them to be able to pay back the loan. One of the group leaders illustrates the incident.

“Where they had to discourse among themselves to fast track the payment of the loan period they were serving so that they can be financed for the coming Eidul-Adha, but they hard to informed the loan officer in charge of their group, who said the contract is six months if they want to pay and get finance before the six months then the whole group should agree to it, it should not be imposed on anyone, and they discoursed, but they could not agree on a term, as a result, it wasn’t possible, so she said many had to struggle to pay in that cycle”. She was Said one of the woman.

4.3 The impact of women finance program on the life of women in the Gambia:

As the first step in the process of providing access to finance, RFS identifies potential women groups in various villages to teach them about the product and form them into groups. From there, they will be finance or granted a loan, and advice will be given to them to invest their loans in productive activities to be able to pay when due, every month using the profit earned from the loan investment. Data were collected to evaluate whether women were involved in income-generating activities, to know the proportion of the women who already had income-generating activities before receiving the loan, and how many of those who did not have a business activity and received the loan. Table 2 shows the respondents’ involvement in income-generating activities before and after a loan.

Table 2: Involvement in income generating activities before and after receiving loan.

Involvement income generating activities	Yes	No	Total
Before loan	26	69	95
After loan	76	19	95
% before	27%	73%	100%
% after	80%	20%	100%
Change in %	53%	-53%	

Before receiving the loan, only 27% of our study respondents are engage in some business activity. This figure rose to 80% after accessing loans, but yet still suggesting that 20% of women who received the loan were unable to start any business activity. While we discuss the reasons for this in Table 2 above, two issues are point out. First, given that a large proportion of women were not already engaged in any income-generating business, but RFS (Reliance Financial Services) nevertheless gave them loans to start up one, well done to RFS for enhancing these women able to access finance and initiate their businesses. However, the fact that a considerable number of these women failed to start-up any business suggests that RFS approach did not adequately appreciate what women’s access to microcredit can do or not do in a context this is one primary reason why some of the women are unable to pay the 18% interest on their loans, which could lead to complication in payment.

The second issue is that a significant number of women (20%) have even failed to invest their loans in any venture that could generate income. Three main reasons accounted for this. First, the initial loan capital went into direct consumption. Several accounts are given about loans use to meet immediate household needs such as the purchase of food and medicine. Second, the loan is voluntarily handed over to their husbands or other family members. And third lack of business opportunity in some remote villages and communities. As a result women, losing the initial loan capital leading to indebtedness that culminates in a gradual but profound socio-economic

privation and disempowerment. The fact that a substantial number of the loans are used for purposes other than investment in income-generating activities could be related to the fact that RFS loan operation policy does not focus on providing access to finance for the women-only but also try to monitor those facing difficulties in paying by cutting their loan or even suspend them and allow them to do only saving. Unfortunately, these management techniques are not always effective, as loans are rarely monitor. Thus RFS does not focus more on women who finance to know the economic activities they are involved in, but they make it explicitly clear to them that, the loan is meant to be pay whoever is not involved in a business that can enable you to pay the loan should not take the loan, but limited household resources, often intermingle to force borrowers who are usually face with other economic necessities into diverting loans into other uses. Of course, the exact use of the loan should not be so relevant if the purpose of the RFS microcredit program was only to enhance women’s access to finance. However, given that many loan recipients do not usually have any form of business activity before receiving the loan, and the fact that the program encourage the investment of loans in income generating activities, but using the loan for activities like school fees or food raises questions about the appropriateness of the program. Our interviews with women suggest, some who take the loan for another purpose different from a business like mention before with the expectation to pay using remittance they will receive from their relatives in abroad, and this is confirm by some of the loan officers, they said on the payment day some women will give them the excuse that my child or my uncle have not send my money yet, which is a clear manifestation that some divert the use of the loan, but still the majority of them pay the loan and the repayment rate of this program is very high it’s at 98%. But the fact is those who invest the loan have more benefits in their life than those who divert the use. Here is the statement we got from one of the recipients of the loan who is now successful in her business and I court.

“I thank God and thank RFS for the support they give me, I have been in business for so many years but all those years I leave from hand to mouth, after I benefit from this loan that is when I expand my business, and I do go to Senegal to buy goods and sell them in the Gambia, my business is doing very well and stated with only D5000 and now am receiving D55,000, and I have two saving account thanks to RFS my life has changed now”. A woman said it during the interview with her.

And after going through the files, there are many women who are also successful, after they have access to the women finance loan. And they strongly agreed to the fact that the loan has improved their life.

Table 3: Loan investment activities or business types by loan recipients.

Activities	Respond	Percentage %
Farming	15	16
Gardening	20	21
Vegetable selling	6	6
Food selling	14	15
Cloth selling	8	8
Poultry farming	9	10
Fruit selling	13	14
Loan given to husband or other family members	10	10
	95	100

Table3: patterns of loan utilization among the 80% of the women who were engaged in some form of business after they received the loan. In table3, it indicates the economic activities most of these women are involved in after they have benefited from the loan. The majority of the women invested their loans in one of the seven (7) different business activities mentioned above. In this research, the following problems were detected that affect women to make change in their life after accessing finance, first issue some raised was, they are involved in a business that has less profit margin. As a result, they have to struggle very well to pay back the loan. Secondly, some of these women are engaged in business-like food selling at schools, market and other public places and fruit sellers they complained about the damage rate of their product because their good are perishable and they do not have proper storage facility as a result affecting their profit margin, another issue raised by the majority of them is lack of independence for them to involved in higher profitable business due to their domestic responsibility, because in the Gambia women are responsible of domestic work and taking care of children in most case, as a result, they do not have time to make certain business investment. Thus they cannot partake in many lucrative businesses. But after engaging the loan officers of RFS, we understood that they are with believe that when women get access to finance, there is a lot of business opportunities that they could invest in making a profit. However, our interview with women indicates a different story, some of them believe that there are business opportunities, but the above issues are the factors hindering them from making a change in their life, and as a result, some of them face complication in paying the interest of 18%. And during the interview, one of the woman raised the issue of time and period of the meeting, I court.

“due to our domestic duties it is challenging for us to attend the monthly meeting regularly, we have to take care of the children and cook for the family whiles our husband are at work, and during the raining season this becomes a big problem for us to attend the

meeting every month because we also have to go to a farm in the morning, these are some the difficulties we encounter with the meeting time, and yet still we find for coming late or been absent, so that`s why we want the time to change. The same responsibilities derived us from venturing into higher profitable businesses.”

But those involved in the business like gardening and faming also said that the loan helps them because they can be able to afford the necessary material for their agricultural activities ranging from seeds to fertilizers, which they said improve their yielding.

Table 4: Income status after accessing finance

Income Status	Business Status		Total
	In Business	Not In Business	
Income increase	10	45	55
Income decrease	4	11	15
No change	11	14	25
	25	70	95

Table 4: shows the distribution of changes in income between women who already had business activity before receiving the loan and those who did not. However the data shows that majority of the women (10) who are in business activities before benefiting the loan reported increases in their income. On the other hand, four (15) of our respondents who reported decreases in their income, (11) were women who were not in any business activities before accessing the loan. Our interviews found that majority of women who reported an increase in their income had invested their loans in productive activities. And they expressed their gratefulness to RFS, because they now make a financial contributions to their family welfare and children`s education. Some of them explained how they used their loans and the incomes generated from the loan investment to provide a quality life for their family in terms of food, clothing, and other expenses of their family.

However, on the other hand, those whose income decreases or remains stagnant is a different story for them. Those women were in a huge pressure because according to them after investing the loan, the business was not able to pay off the loan for them they have to struggle to sell some of their assets or asked their relatives to pay off the loan, so instead of improving their life it decreases they`re leaving standard. Some of them even said when they paid off the loan they will leave the program and just continue to save, because they believed the loan could not bring any improvement in their life looking at the kind of business they are engaged.

“At the moment I lose everything to pay off this loan, I gave money to my brother who is a mobile dealer, and he said he would go to Senegal and buy mobile phones and sell them in the Gambia. But he said the money was lost, how am I going to pay an amount of D30, 000? And now the loan cycle has ended, everyone paid except me, and as a result of my areas the whole village will not receive a loan, what am I going to do”. (Story of a woman).

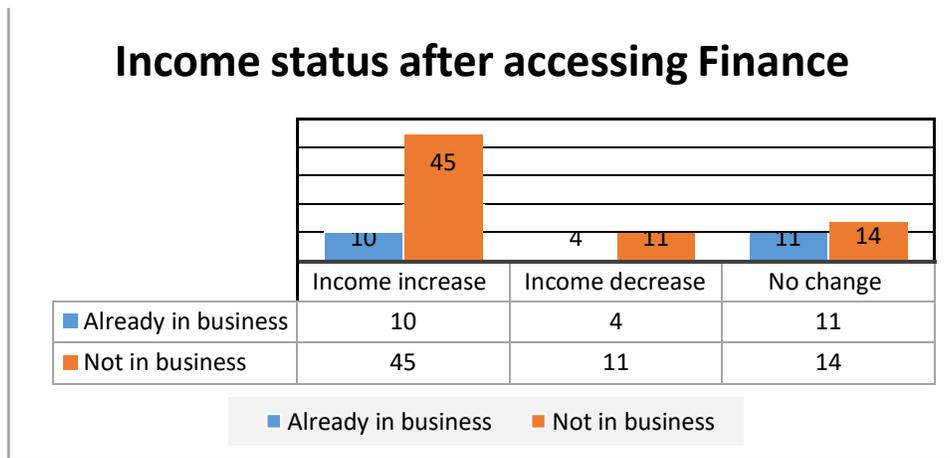


Figure 1: Income status after accessing Finance.

Figure 1: is a representation of women’s valuation of their income status after accessing finance; these results are the answer to the questions that were asked to women to explain their income after they have access the loan. **Figure 1** indicates that 58% (55), 16% (15), and 26% (25) of the women sampled, reported that their income levels have improved, worsened, and not changed, respectively. From this data 58% of the sample who get access to finance through this program reported improvement in their income-generating activities, and they explain many benefits that they derived from this program since started taking the loan to date, we have visited some of their shops and business places in different locations where monies are invested, and the business is doing well, so they feel empowered by this program. Our interview with one of them said.

“with the help RFS women finance program, am now able to send my children to school, feed them and shelter them, and am a single parent, all these weren’t possible before, when I started taking this loan I was skeptical but now Alhamdulillah it transformed my life, I own a house, shop among other assets all thanks to RFS women finance program, and not only me but this program has changed the lives of many women in the Gambia.”

However on the other hand 42% of the women also interviewed came with a different story about the program, some of them said the program does not bring any change in their income, what they were earning before still is the same no change, while others even said the program in fact, decreases their income-generating activities, they said before receiving the loan we were doing better but after they took this loan things turn otherwise, but in our research, we realized that most of these women diverted the purpose of the loan, some used it for family support activities, while some have invested it but the investment does not go well, as a result, they defaulted. These women narrated their pains; they often have to borrow from friends and other moneylenders to pay the monthly interest on their loan to avoid default and avoid the social pressures and shame that comes with default. A story of a woman when she is ask this question.

“What problem did you encounter after taking this loan? I have encounter a lot of problems after taking this loan. Because of this loan I have been disrespected, insulted and humiliated by my friends in this community, the reason was I wasn’t able to pay for three months because didn’t have money. So on the day of third-month payment, which is the payment of the half principal, all my group members went to pay except me. Fact, I was busy going from one place to the other to borrow money. But after they completed the meeting, my name was called several times, the group leader and other members confronted me at my house asking for the money. I told them I didn’t have the money yet, but my brother promised me that he would pay for it. They use bad words, insult, and abusive language on me. Some said I was lazy, dishonest; and some even threatened to take me to police if I failed to pay. And there are several others who face the same pressure when they fail to pay the money”.

4.4 Does the main objective of this program achieved? Providing access to finance for the women in the Gambia since its inception 2014 to 2019, is it growing or decreasing?

Many studies (Duflo, 2012, Ghosh, 2013; Omorodion, 2007) has conduct to determine the impact of microfinance in the life of poor people, especially women. Microfinance is recognized as the fundamental development tool, and with all the current issues within the industry, it continues to grow. We consistently reviewed the evidence of the impacts of micro-credit and micro-savings on poor people. By considering its impacts on income, savings, expenditure, and the accumulation of assets, as well as women’s empowerment, and job creation. The available evidence shows that microfinance harms as well as good, to the livelihoods of the poor

(van Rooyen, Stewart, & de Wet, 2012). And there is a research done in one of the countries called Ghana which is in the same region with The Gambia (West Africa) following was the finding, After a thorough review of previous surveys that focus on impact assessments of MFIs, reported that Sinapi Aba Trust (SAT) had a positive impact on the economic conditions of its clients (Breu et al., 2008). Going through the efforts of microfinance from different parts of the world indicates, access to microfinance has had a significant economic impact, and this impact has been huge for those closer to the poverty line than those far away (Robson, 2016).

Taking into account all the situations courts from different research papers, this program by RFS is rapidly improving daily, and now it is available in all the regions of the Gambia, women can now access micro-credit and make saving easily, the only requirement they need is to be in a group and ready to guarantee one another, and still, this program is improving trying to collaborate with various stage holders in the communities, women group to get more on the program. Just of recent Reliance financial (RFS) services sign a memorandum of understanding with KMC (Kanifing Municipal council), which is the biggest region in the Gambia to provide a mini loan grant of D100 million to the various women group in the municipality. And I court the press released.

"Reliance in partnership with KMC launches a GMD100 Million Loan Fund for Women entrepreneurs of the Kanifing Municipality and names it "Dollel Jigeen." The objective is to offer 100,000 petty women-owned businesses access to microcredit with or without any prior banking history. To be part of this program, the women just need to form a small group with a minimum of 5 people within your neighborhood and call your local Councilor or visit the nearest Reliance branch. Your group will be enrolled immediately, and within 3 to 5 working days, your loan will be processed".

No collateral is required. As of 2019, reports this program have 35,000 women who are benefiting from this loan scheme. And of course there are clear indications that shows the rapid growth of this program, now this program is available in all the region of the Gambia both rural and urban settlement compared to in 2014- 2015 when the product covers only two regions and with only a few communities, and the program grant a loan amount of 100,000,000 every six month and 95% of it is recovered, therefor there is no dispute that the program is indeed growing and also ease access to finance for the women in The Gambia.

5. Conclusion:

The extension of microcredit to women has the potential to impact powerfully on women`s empowerment effects of the micro-lending operation of RFS microcredit program to poor women in The Gambia. Our findings indicate that some women are empowered as a result of having access to loan, while some feel humiliated as a result of harassment and abuses they face due to their indebtedness and inability to repay loans, our finding suggests that those women who feel empowered as a result of access to finance are those who did not divert the use of their loan, but instead use it for the purpose it is mended for, while on the other hand, those women who feel disempowered are those who divert the use of the loan.

However, these results must be interpreted with the knowledge that the RFS Women Finance program will not just come within few years to close the Gap that has been existing for centuries between men and women in terms of access to finance. Furthermore, it will be too ambitious to expect that years of male domination over women in access to finance will be close by a few years of women finance programs.

Our findings also show that the impact of any microcredit program depends on the socio-economic and cultural contexts in which it is implement, that normally dictates the benefits women will get from the loan product, it may be at an advantage to some and the disadvantage to others, depending on their situation and whether they are able to service their loan effectively. Our findings also indicates that in a society where women have very few investment opportunities, such as access to market, not in gardening, or not allowed to partake in any economic activities, those are not favorable places to give loans. It suggest that RFS need to revisit their lending process to put into consideration the following things. First, they should concentrate on the areas that have access to the market, involved in economic activities so that if they take a loan they will be able to pay back; this will be at the advantage of both RFS and recipients of loan for the sustainability of the program. Second, it might be significant to determine which clients are involved in economic activities and those who have potential economic activities to be able to use the loan effectively, so that it can be a benefit for both parties. And this process may require just assessing the individual loan customers but also to screen the suitability of the environment.

Furthermore, in addition to the above points, the timing of loan disbursement, the amount finance to women groups, interest rate and repayment period are issues that need to be revisited, our study indicate that women complained to be financed in a period that is not productive, meaning period where there are less economic activities for them to invest in, and also some women are over finance meaning they are given loans that they could not be able to use effectively, and some woman is taking two loans from other companies, and at the end, they will take a loan from one company and pay the others, which will lead to the higher default rate. And also, the low profit yielding business opportunities available for women to investment, all these are factors that will increase the debt liability of women.

The findings of our research support the need to consider the timing of disbursing the loan because the women will never reject the money, even if they know that after taking it there is a limited investment opportunity, therefore we recommend the financing time to be scheduled on a period when there are a lot of economic activities and investment opportunities for the women. In the same vein, we recommend that RFS embark on proper screening to find those women who are taken a loan from other microfinance institutions and take the necessary steps to stop multiple borrowing, and also tell the officers to strictly follow the policies of the program in order to avoid over financing women, given them a loan that they cannot be able to invest and pay when due.

The interest rate we find out that women are complaining about the interest rate, and some are demanding for a reduction in the interest rate; we think RFS needs to consider their request and see what they can reduce from the interest. Another issue that is raised was the period of loan repayment; some said that would prefer to pay the entire principal in the end of the sixth month rather than paying the half in the third month and the other half at the sixth month, RFS need to revisit the repayment period.

Finally, the implementation of joint liability policy, so that if one of the group members defaulted the other group members have to use their saving and pay for that member, this policy needs to be looked at, because what some of the women complain is that, those they usually pay for always refuse to pay back their money and in the end, it causes a problem among them and encourages others not to pay too with the mindset that the group will pay.

In conclusion, the coming of this women finance product cannot just close the Gap miraculously, access to finance the gap between men and women in a country like the Gambia where women did not have the means to access finance from the conventional banks for a period of time though there is no doubt that microfinance programs such as this women finance program will go a long way in closing this gap and give equal chance if not more opportunity to women in accessing finance. However, with the role microfinance institutions and coming up with a specific product targeting only women, there is a hope that in future women will have better opportunity to access finance, which will help in eradicating poverty in our society.

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The Paradox Of The Presidential Power Of Pardon: Tanzania In Perspective

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DOI: 10.29322/IJSRP.10.09.2020.p10523

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10523>

ABSTRACT

In February 2020 President Donald John Trump of the United States of America (USA) granted four clemency orders and seven pardons, which in turn rejuvenated debate about pardon powers of the President. Similar situation emerged in Tanzania in December 2019 when President John Pombe Magufuli granted 600 pardons in commemoration of 58th Anniversary of independence of the country. This drove me to write this paper giving brief explanation of presidential pardoning power. The paper explains historical snag of the power in the world, focusing on England and USA and then relates it to Tanzania. In the process the article brings to the fore salient features of presidential power of pardon like self pardoning and procedure of its exercise. The main conclusion drawn from the analysis points out that the power of pardon in Tanzania is wide and unlimited and the President can exercise it to convicts of any offence.

Key words: Power of pardon, Salient features, Extent of the power, Self pardoning

1.0 Introduction

This article analyses the origin of the pardon power generally. It examines scope of the power in England and USA and explores its position in Tanzania. The article critically explores the limitations of the pardon power, assesses its potential for abuse and takes up the possibility of self pardoning in all the three jurisdictions. England has been taken because from her, both USA and Tanzania base their legal jurisprudence. USA and Tanzania have been picked because both share some similar features major one being that the two countries follow presidential system of government.

The paper therefore is set to see if the experiences of England and USA can be emulated to remedy the deficiencies experienced in Tanzania in so far as presidential power of pardon is concerned. From what has been gathered the article has summarized the observations, critiques and recommendations on reforms needed to be effected in exercise of presidential power or pardon.

1.1 Methodology

In collecting and organizing materials for this paper, I conducted research in libraries for literature that specifically focuses on presidential power of pardon. This was by examining historical background of the power, its governing laws and its procedures and

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10523>

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practices. I have relied mostly on publications in books, journals and papers presented in seminars and conferences, comments from legal practitioners as well as other scholars that have addressed the issue in three countries, which are England, USA and Tanzania.

After reading the writings on presidential power of pardon I have identified and analyzed the position of constitutional law of England, the constitutional provisions of the US Constitution of 1787 and the Constitution of the United Republic of Tanzania (CURT) of 1977. All of these three countries share a common law background and so have something in common on presidential power of pardon. This means I consulted and compared the presidential power of pardon in England, USA and Tanzania. Before the article embark on the analysis of presidential power of pardon hereunder is a recap of its history.

2.0 Synopsis of Presidential Power of Pardon

The exercise of the presidential power of pardon can be traced to a very ancient ancestry with the earliest roots in practices among the Romans. Despite being very old its exercise has always been under criticisms for being inconsistent with a solid theory of criminal law. Beccaria, C.B for example contends that pardons are capricious and irregular and thus inconsistent with a good theory of criminal justice.¹ Pardons are also argued to be an inherently idiosyncratic arbitrary exercise of presidential authority. It is further argued that in exercise of presidential power of pardon one person makes a decision without standards or formal guidance.² This is so because in granting pardon ‘the supposition of the connivance of the judge is entirely excluded.’ The pardon is the presidential decision to allow any person to be absolved of guilt for any alleged crime charged as if the crime never occurred.³ The power of the President to grant pardon is discretionary, final and conclusive and no appeal can be made against the decision of the President in exercise of power to grant pardon. This is so because pardon power is not the subject of legal rights but begins where legal rights end.⁴ That is why from the earliest years of the Republics, pardon was used to benefit ordinary people for whom the results of a criminal prosecution were considered unduly harsh or unfair. However, the power of the President to grant pardon can be challenged by way of judicial review.

2.1 Meaning of Pardon

The pardon is sometimes and in some countries known as prerogative of mercy or clemency.⁵ As such the power to pardon also includes more limited acts of clemency like reprieves (delay of sentencing) and commutation (reducing) of sentence or punishment.⁶ Reprieve refers to the act of suspending or staying execution of the sentence met by the courts. The President of the country has

¹ See Moore, K. D, Pardons 39 (1989) citing C.B., Beccaria, *An Essay on Crimes and Punishment*, pp. 158-59, (1953)

² Rosenzweig, P., Reflections on the Atrophy pardon Power, *Journal of Criminal Law and Criminology*, Vol. 102, Issue 3 (2012), p. 603

³ Weihofen, P., *The Effect of Pardon*, 88 U. Pa Rev 177, (1939), p. 179

⁴ See the words of Lord Diplock in the case of *De Freitas vs. Benny* (1976) AC 239

⁵ Ekwenze, S.A.M., *Presidential Pardon and Prerogative of Mercy: A Necessary National Soothing Balm for Social Justice*, Anambra State University, Igbariam Campus, Lagos, (2011), p. 2

⁶ Pfiffner, J.P., *The Scope of the President’s Pardon Power*, George Mason University, (2010), p. 1

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power to reprieve the whole of the sentence or part of it at any time and for any offender. The reprieve is taken by the President as a preparation stage for granting of pardon. For that before the President grants pardon to the offender he may first grant reprieve in which case the offender shall not serve his sentence awaiting for pardon.

The pardon once pronounced in favour of the person will usually restore civil rights which were lost as a result of the conviction. So pardons generally restore the right to vote and the right to run for and hold public office. The pardon however, does not bar any civil legal actions against the person pardoned. So, the person who receives a pardon for murder may, after his release from custody, be subject to a law suit for wrongful killing.

According to Garner, B A commutation means the executive's substitution in a particular case of a less severe punishment for a more severe one that has already be judicially imposed on the defendant.⁷ It can be based on discovery of pertinent facts that were not known or available when the sentenced was decided, or that arose and were developed afterward. It may also be based on the executive's statutorily or constitutionally granted discretion, regardless of the facts. Commutation was an 'extraordinary' remedy for person seeking reduction of sentence.⁸ It is because of this that after 1910 grants to prisoners in USA were styled 'sentence commutation' replacing the full or conditional pardon more frequently used in early years to release a person from a prison term.⁹ Commutation is rarely granted but may be considered for old age, illness, disparity or undue severity of sentence.

Once granted commutation normally cannot be rejected whereas at least the pardon can be rejected. In the case of *Biddle v Perovich*,¹⁰ President Coolidge commuted a federal death sentence, and he was transferred to the state of Connecticut, which convicted him of the murder and sentenced him to hang. Biddle appealed by arguing that he had not accepted the commutation of his sentence and thus it was not valid. Justice Holmes wrote that the commutation of a sentence did not have to be accepted by the recipient in order to be valid. He stated that 'commutation was a part of the constitutional scheme and the public welfare is more important than a criminal's wishes.'

2.2 Scope of Power of Pardon

In all civilized and refined societies pardon has become considered as an act of grace. It is something of a living relic from the days when rulers possessed the power to punish and to remit punishment as an act of mercy. It is the oldest form of release procedure and it survives in vivid form in various States.¹¹ The pardon may be granted at any time either before institution of the criminal proceedings

⁷ Garner, B. A., Black's Law Dictionary, 9th Edition, A Thomson Reuters Business, Dallas, (2004), p. 318

⁸ Love, M.C., The Twilight of the Pardon Power, *Journal of Criminal Law and Criminology*, Vol. 100, Issue 3, (2010), p. 1191

⁹ Ibid

¹⁰ 274 US 480 (1927)

¹¹ Sebba-Leslie, Criminology, The Pardoning Power, *World Survey*, Vol. 68, Issue No. 1, (1977), pp. 83-85

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but after commission of the crime, during pendency of the criminal proceedings or after conviction for the crime depending on the laws of the country.¹² The pardon is granted to the deserving persons especially to those who were thought to have been wrongly convicted or who claim to have been wrongly convicted.¹³ By granting pardon the President can set free any offender who has been tried and convicted by the courts. In some countries the persons who accept the pardon implicitly admit guilt. But once the person is granted pardon he is cleared of all guilt and he becomes as if he had never been tried or convicted of any offense. The persons who are granted pardon therefore has all the rights as any person who had never been subject to criminal charges in courts of law.

The pardon is entrenched in the Constitution of the country as a way to supplement judicial justice. This is because it is possible sometimes that through judicial justice a wrong person may be convicted and the real criminal who should be convicted may be discharged or acquitted. In the case of *Umaru vs. the State*,¹⁴ Nnamani, JSC said;

“Those accused persons ought not to have been discharged. Luckily for them, however, their case is not before this court there being no appeal against their discharge. What is, therefore, in issue is whether these errors do in any way affect this case of the appellant.”

The words of Nnamani, JSC confirm that it is sometimes possible for the offender to be acquitted wrongly and innocent person may wrongly be convicted. In view of that the pardon is taken to be mode of attaining social justice and as the last line of defense for justice. Jurisprudence suggests that legislature and courts of law have no ability to infringe on the presidential power of pardon. It insists that the pardoning power is an enumerated power of the Constitution and that its limitations, if any, must be found in the Constitution itself.¹⁵

2.3 Self Pardoning as Part of Presidential Pardon Power

The President is human being and so he may error or may commit a crime while in office. If the President commits the crime which is subject to criminal proceeding he shall be convicted by the court. In this way the President may be tempted to exercise presidential pardon power to pardon himself from criminal proceeding or from conviction. This is what is called self pardoning as part of presidential pardon power. Self pardoning is possible since the President, in various ways, may be subjected to due process of law.¹⁶ The President however, cannot grant pardon to himself. This is because ‘no one shall be the judge in his own cause.’ This paper

¹² Hastedt, G.P., Presidential Pardon, White House Studies Compendium, Nova Science Publisher Inc. (2007), p. 328

¹³ Ekwenze, S.A.M., op. cit, p. 2

¹⁴ (1988)1 NWLR (pt7)274

¹⁵ Menitove, J., The Problematic Presidential Pardon: A Proposal for Reforming Federal Clemency, *Harvard Law & Policy Review*, Vol. 3, (2009), p. 451

¹⁶ See Bayer, P.B., The Due Process Bona Fides of Executive Self Pardon and Blanket Pardons, Scholarly Works, (2017), pp 95-170

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however, argues that since the presidential power of pardon is wide and mostly unlimited the President may pardon himself subject to the fact that he comports with the principle of fundamental fairness.

2.4 Control of Exercise of Presidential Power of Pardon

Menitove J. T argues that the presidential power of pardon should have three main goals. First the presidential power of pardon must be sufficiently agile to respond to the public interest. Second, the procedure for exercising pardoning power must reinvigorate the pardoning power so as to make the system more responsive to offenders deserving it. Third, there must be a mechanism to prevent any presidential abuse of the pardoning power. He argues that the creation of a small partisan presidential clemency boards can achieve those three goals. From what Menitove, J. T says constitutional law has devised mechanisms to control exercise of presidential power of pardon in order to avoid abuse by the President. This is important because a wide power to the President to grant pardon can be subject of abuse by the President. The President can, for example, grant it as part of bribe transaction in which he may pardon the persons who made great contribution during campaigns as part of *quid pro quo* arrangement.

There are different modes of controlling exercise of presidential power of pardon. In some countries there are specified bodies of State which assist the President in exercising the pardon power.¹⁷ The aim of these bodies is to assist and control the President in his exercise of power of pardon. But in most cases these bodies are mere rubber stamps because they do not have real power to prevent the President to use the presidential power of pardon. Yet the bodies have been recommended to avoid the President to use pardon 'as a means by which to protect those with whom he had conspired to do harm to the State by adhering to or giving aid and comfort to its enemies.'¹⁸ This is so because the Presidents are not always some ones of pure social character and high intelligence.

This paper argues that the most effective way to control the presidential power of pardon is the Constitution to be effusive on the procedure, steps and requirements of the pardon. The Constitution of the Republic of Uganda of 1995 is one of the Constitutions of the country which are fulsome for control on the exercise of the power of pardon. The other mode may be through the use of courts, although not by way of petition. The presidential power of pardon can be limited through judicial review. In the case of *Ohio Adult Parole Authority v Woodard*,¹⁹ the US Supreme Court stated that pardon power is appropriate subject for judicial review.

Having analyzed the synopsis of the presidential power of pardon generally hereunder is an account of the presidential power of pardon in specific country. The paper has picked three countries, which are England, USA and Tanzania. England has been taken

¹⁷ See for example Article 121 of the Constitution of the Republic of Uganda of 1995

¹⁸ Kalt, B.C., Five Myths About Presidential Pardons, The Washington Post, (2018), p. 3

¹⁹ 523 US 272 (1998)

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because it is believed that pardon power originates from royal prerogative of mercy which is exercised by the Monarchs of England. USA like Tanzania is the country which has Presidents and both have the presidential power of pardons in their countries.

3.0 Pardoning Power in England

England is the country with unwritten Constitution and it is a country whose head of State is Monarch. For that England does not have President. Despite having no President there is pardoning power, which is known as royal pardon.²⁰ The royal pardon is the power, equivalent to the presidential pardon power, which is exercised by the Monarchs of England. Legal historians like William Blackstone have traced royal pardon to the laws of England the Confessor. According to Blackstone the King used the royal pardon as part of pure grace of the Sovereign to show mercy to an offender by mitigating or removing the consequences of conviction. This is so because during coronation oath the Monarchs promise that justice in England shall be administered in mercy. Basing on this perceptive analysis of the presidential pardon power without an understanding of it from England becomes incomplete. It means in order to understand the position of the presidential power of pardon in the world it is significant to examine the origin of the power as it evolved in England.

3.1 Origin of Pardon Power in England

Antecedent of the royal pardon in England is rooted deep in antiquity. Grupp, S for example suggests that the royal pardon has its origin among the Teutonic tribes.²¹ But gradually and in juxtaposition with the growing nationalization of England the royal pardon became increasingly solidified. In 1535, Parliament permanently secured the King's power with the enactment of 27 Henry VIII, Chapter 24, which provided;

“That no person or persons, of what estate or degree so ever they be ... shall have any power or authority to pardon or remit any treasons, murders, manslaughters or any felonies whatsoever they be ... but that the king's highness, his heirs and successors, kings of the realm, shall have the whole and sole power and authority thereof united and knit to the Imperial Crown of this realm, as of good right and equality it appertaineth; any grants, usage, prescriptions act or acts of parliament, or any other things to the contrary notwithstanding.”

It is also argued elsewhere that the roots of the presidential pardon power are found in the history of medieval England.²² The Framers of the Constitution all over the world therefore, adapted the pardon provision from the royal English prerogative of Kings, which dated from before the Norman Conquest. In England the royal pardon power is a discretionary power based on the ancient rights and

²⁰ Kalt, B. C., op. cit

²¹ Grupp, S., Some Historical Aspects of the Pardon in England, *The America Journal of Legal History*, Vol. 7, No. 1, (1963), p. 52

²² Ducker, W. F., “The President's Power to Pardon: A Constitutional History, *William and Mary Law Review*, Vol. 18, No. 3, (1977), in Pfiffner, J., op. cit, p. 1

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privileges of the Monarchs to grant mercy. This practice is based on the understanding that the Sovereign possesses the divine right and hence can exercise this prerogative on the ground of divine benevolence.²³

For centuries in England, the royal pardon was the sole means to remedy an injustice by ameliorating harshness of sentence imposed by the courts. It also operated to temper the inadequacies of substantive law before the development of common law or statutory defenses, like insanity and self defense. Finally, it also came to provide safety net when judicial appeal had been exhausted.

3.2 Self Pardoning Power in England

In England, there is no question about self pardons or their legality because there can be no criminal executive actions. The law of England supposes it impossible that the Monarch can act unlawful or improperly.²⁴ This means it is common understanding in England that there is nothing that the King can do that will require a pardon. This is partly due to the long existing doctrine of “the King can do no wrong.”²⁵ This is expressed in Latin maxim as *rex non potest peccare* which implies there is no redress if the King injures a citizen.²⁶ Of course, Parliament could and occasionally did, exercise an extra legal option (removing the King) in response to which a self pardon would have been useless.²⁷

The absence of executive criminal liability in England removes possibility of the Monarchs to self pardoning themselves as they, basing on *rex non potest peccare* maxim, cannot commit any crime which will make them to be convicted and thus requiring the royal pardon. However in 1678 self pardon was about to happen for the first time in England. This was in relation to the impeachment of Earl of Danby Thomas Osborne.²⁸ The Earl, Thomas Osborne was a Lord High Treasurer of England under King Charles II. In December 1678, Parliament began impeachment proceedings against him for conspiring with France. The grounds for the charge were that Danby had written a letter to the British ambassador in France that empowered the ambassador to make an offer of neutrality as between France and Holland. Danby however was merely acting in accordance with the orders of the King. Days later Parliament had begun preparations for war against France. Parliament realized what happened, but the King was ‘beyond reach’ of legal remedies and so impeaching hapless Treasurer was the best that Parliament could do. Unfortunately for Parliament, the King had in March 1679 issued a pardon for Danby. If King Charles II had only been trying to protect Danby he could have pardoned the Earl in December, but the King was now acting to solve a different problem. An examination of Danby’s actions would have revealed that King Charles II had been receiving bribes from France. The pardon ended the investigation and spared the King embarrassment.

²³ Wolfe, G.B., I Beg Your Pardon: A Call for Renewal of Executive Clemency and Accountability in Massachusetts, (2007), p. 27

²⁴ Chitty, J, A Treatise on the Law of the Prerogatives of the Crown, Joseph Butterworth and Son, London, (1920)

²⁵ Barry, H., The King Can Do No Wrong, Virginia Law Review, Vol. 11, No. 5, (1925), p. 352

²⁶ Barry, H., *ibid*, p. 357

²⁷ For example King Edward II (1327), King Charles I (1649) and King James II (1688) were all deposed by Parliament

²⁸ Detailed account of the incident see Duker, W.F., The President’s Power to Pardon: A Constitutional History, 18 WM & Mary L. Rev. 475, (1977), pp. 487 - 95

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The King's action sparked 'constitutional confrontation' with Parliament which had come to rely on the impeachment power to ensure proper governance. As debate raged as to the legality of the action of King Charles II, those who believed the Danby pardon to be invalid looked poised to win the argument. But the King defused the crisis by dismissing Parliament. By so doing King Charles II won the battle but the Monarchs lost the war. This was so because Parliament enacted the Act of Settlement of 1701 which forbade pardons from being used to preempt impeachments. The Danby episode vividly showed the danger of giving the executive an unrestricted power to pardon.

3.3 Control of Royal Pardon in England

The annals of the pardon power are replete with suggestions of the power's propensity for abuse. As power is propensity for abuse there is always a need to control any power, including royal pardon power. The chronicles of royal pardon power in England however, does not show any abuse. The only incidence which was close to abuse of power was episode in relation to the impeachment of the Earl of Danby Thomas Osborne.

Originally the royal pardon power was absolute, being unlimited by any cause and the King often granted a pardon in exchange for money or military service. Thus for a long time the royal pardon power was absolute, giving the King authority to pardon or remit any treasons, murder, manslaughters or any kind of felonies.²⁹ Various Kings then expanded and consolidated the royal power; ignoring a series of attempts by Parliament to limit it.³⁰ But this was not taken by Parliament in good terms. Parliament feared that the King could, at any time in the future, abuse the power. For that a number of times Parliament tried unsuccessfully to limit the exercise of the royal pardon power. The attempts paid off when it finally succeeded after it passed three laws; the Bill of Rights of 1688, the Habeas Corpus Act of 1679 and the Act of Settlement of 1701. These laws were enacted in the aftermaths of the Osborne impeachment.

The Bill of Rights of 1688 deprived the Crown of its former power to suspend or disregard the operation of a given law. The Habeas Corpus Act of 1679 prohibited the royal pardon in cases in which persons were convicted of causing others to be imprisoned outside England and thereby placing them beyond the reach of English habeas corpus. It was the Act of Settlement of 1701 however, which actually placed limitations on the uses of the royal pardon power by the Monarchs of England. This is so because the Act of Settlement of 1701 inter alia forbade pardons from being used to preempt impeachment.³¹ The Act provided;

“That no pardon under the Great Seal of England be pleadable to an impeachment by the Commons in Parliament.”

²⁹ Kalt, B. C., Pardon Me?: The Constitutional Case Against Presidential Self Pardons, Notes, *The Yale Law Journal*, Vol. 106: 779, (1996), p. 783

³⁰ Duker, W. F., op. cit, pp. 525-26

³¹ See 12 & 13 Will. 3, ch. 2, s. 3 (1700 – 01) (Eng.)

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By this provision it means the Monarchs in England could not use pardon power to subvert the impeachment process and thereby cover up his own misdeeds. In this way the Act of Settlement of 1701 thus, limited the exercise of the pardon power by the Monarchs of England, although the power of the Monarchs to pardon after sentencing was not correspondingly limited. Today the royal pardon power is a personal prerogative of the Crown which Monarchs exercise in England and Wales in the binding advice of the Secretary of State for Home Affairs.

4.0 Presidential Power of Pardon in USA

USA is a country which follows presidential system of government. It is the country which has written Constitution, the US Constitution of 1787. As there is President the presidential power of pardon is part of the constitutional law of USA, being explicitly provided in the US Constitution of 1787. The annals of the presidential pardon power in USA however, show that the power did not come in easy way. During the drafting of the US Constitution of 1787 at Pennsylvania in Philadelphia there was astringent debate on the extent of the presidential power of pardon.³² But the Framers of the US Constitution of 1787 finally agreed to include the presidential pardon power in the US Constitution of 1787. This was inserted in Article II (2) of the US Constitution of 1787 which provides that ‘the President shall have the power to grant reprieves and pardons for offences against the United States, except in cases of impeachment.’ By this provision the President of USA can grant pardon, reprieve or commutation.

The presidential power of pardon in USA is understood in the same way as it is understood in other countries. For example in the case of *United States v Woodrow Wilson*,³³ Chief Justice Marshall defined the pardon to mean an act of grace, proceeding from the power entrusted with the execution of the laws, which exempts the individual, on whom it is bestowed, from the punishment the law inflicts for a crime he has committed. This definition fits well the already provided definitions.

4.1 Extent of Presidential Pardon in USA

The Framers of the US Constitution of 1787 saw it fit to vest the presidential pardon power in the President of USA. So in USA the President may grant pardon after commission of the crime but before institution of the proceedings or during pendency of the

³² The Records of the Federal Convention of 1787, edited by Max Farrand, Yale University Press, New Haven, Vol. II, (1966), p. 626

³³ 32 US (7 Pet.) 150, 160-61 (1833)

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proceedings or after conviction of the accused of the crime charged.³⁴ At times like this, the President of USA takes off his cap as the Commander in chief and puts on the role of Consoler in chief.³⁵ The pardon is granted to the deserving persons and for whatever offence. The President of USA may, therefore, grant pardon to accused of treason, murder, high crimes or misdemeanours. According to the debates of the Conventionalists of 1787, it was accepted that the President of USA must have such a wide power in relation to pardon. The Conventionalists agreed by stating that;

“The President of the United States has the unrestricted power of granting pardon for treason; which may be sometimes exercised to screen from punishment those whom he had secretly instigated to commit the crime, and thereby prevent a discovery of his own guilt.”³⁶

The presidential power of pardon once pronounced in favour of the person restores civil rights which were lost as a result of the conviction. So in USA the presidential pardons restore the right to vote and the right to run for and hold public office. In the case of *Ex part Garland*,³⁷ the Supreme Court of USA stated;

“A pardon reaches both the punishment prescribed for the offence and the guilt of the offender, and when the pardon is full, it releases the punishment and blots out of existence the guilt, so that in the eye of the law the offender is as innocent as if he had never committed the offence. If granted before conviction, it prevents any of the penalties and disabilities consequent upon conviction from attaching; if granted after conviction it renounces the penalties and disabilities, and restores him to all civil rights; it makes him, as it were, a new man, and give him a new credit and capacity.”

But the pardon does not bar any civil legal actions against the person pardoned. So, person who receives a pardon for murder may, after his release from custody, be subject to a law suit for wrongful killing.

The presidential pardon power is unlimited. Foster, M stated that the pardon power vested by the US Constitution of 1787 in the President is broad, extending to every offence known to the law.³⁸ As such there is no legislative or judicial limitation for the President to exercise his presidential pardon power. This was stated by Chief Justice Warren Berger in the case of *Schick v Reed*,³⁹ where he wrote that the power flows from the Constitution, not from any legislative enactments, and that it cannot be modified, abridged or diminished by the Congress.

³⁴Foster, M. A., Presidential Pardon: Overview and Selected Legal Issues, Congressional Research Series, Legislative History, New York, (2020), p. 4

³⁵ Healy, G., The Cult of the Presidency: America's Dangerous Devotion to Executive Power, Cato Institute, Washington D.C, (2009), p. 205

³⁶ The Senate Judiciary Committee, Pennsylvania Review, the Power of the President to Grant a General Pardon or Amnesty for Offences Against the United States, *the American Law Register*, Vol. 17, No. 10, New Series Vol.8, (1869), pp. 532-589

³⁷ 71 US 333, 380-381 (1866) as quoted in Foster, M., Presidential Pardons: Overview and Selected Legal Issues, Congressional Research Service, (2020), p. 4

³⁸ Foster, M. A., op. cit

³⁹ 410 US 256

4.2 Procedure for the Presidential Power in USA

In exercising the power of pardon the President of USA is guided by the US Constitution of 1787 and the Code of Federal Regulations, which are annually published. According to Regulation 1.1 of the Code of Federal Regulations the President of USA may exercise presidential pardon power to any person if there is request from the person to the President. Accordingly, all requests for presidential pardon for federal offences are sent to the Office of the United States Pardon Attorney of the Department of Justice. Thus, the body which assists the President in exercising presidential power of pardon is the Office of the United States Pardon Attorney of the Department of Justice.

After receiving requests for pardons the Pardon Attorney then prepares recommendations on each of the request for the President of USA to determine. The Pardon Attorney is required to make recommendations on each of the request presented to him. Generally, the Pardon Attorney does not recommend for prerogative of mercy if the person requesting it is on probation, parole or supervised release.⁴⁰ Again if the person who requests pardon was convicted by the court martial his request must be accompanied with the recommendations by the Secretary of the Military Department that has original jurisdiction over the court martial trials.⁴¹ After the Pardon Attorney or Secretary of the Military Department as the case may be to prepare the recommendations on requests for pardon the recommendations shall be sent to the President of USA for final decision. The President of USA is not bound to follow the recommendations of the Pardon Attorney or the Secretary of the Military Department. Regulation 1.10 of the Code of Federal Regulations gives the President of USA discretion on exercise of presidential pardon. This provision reads;

“The regulations contained in this part are advisory only and for the internal guidance of Department of Justice personnel. They create no enforceable rights in persons applying for executive clemency, nor do they restrict the authority granted to the President under Article II, Section 2 of the Constitution.”

From the words of Regulation 1.10 of the Code of Federal Regulations exercise of presidential power of pardon by the President of USA is discretionary. The vivid example of the discretionary power of the President to grant pardon was seen, among many, in relation to pardoning of a postal thief. In 1897 Attorney General Grover Cleveland's last pardon went to a postal thief who he opined that he was not entitled to pardon. However, it was revealed that the prisoner had a wife and 8 children who are in a destitute condition and his wife had a stroke of paralysis, from which there is no hope of her recovery.⁴² Despite negative recommendation of the Attorney General the President granted pardon to the postal thief.⁴³

⁴⁰ Regulation 1.2 of the Code of Federal Regulations

⁴¹ Regulation 1.1 of the Code of Federal Regulations

⁴² (1896) ATT'Y GEN. ANN. REP. 187-88 (1896)

⁴³ (1897) ATT'Y GEN. ANN. REP. 187-88 (1897)

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Where the President of USA accepts the recommendations of the Pardon Attorney or of the Secretary of the Military Department as the case may be and grants pardon, the Pardon Attorney shall notify the person concerned and the case file shall be closed.⁴⁴ In case the President refuses to exercise the presidential power of pardon even after receiving positive recommendations from the Pardon Attorney or the Secretary of Military Department the Pardon Attorney shall likewise notify the person concerned and the case file shall be closed accordingly.⁴⁵ This implies that the decision of the President of USA in exercise of presidential power of pardon is final and conclusive.

4.3 Self Pardoning in USA

Article II (2) of the US Constitution of 1787 is silent on self pardon. The silence means however, self pardon in USA is possible. Self pardon was about to occurred in 1974 and 1992. In 1974 President Richard Nixon was accused of Watergate scandal. As his presidency approached to its end, his aides outlined his option, to pardon himself and then to resign. But he opted to resign and left his fate in the hands of President Gerald Ford.⁴⁶ As luck would dictate, President Gerald Ford pardoned him.⁴⁷ In 1992 President George Bush was involved in Iran–Contra suspects and Special Prosecutor Lawrence Walsh threatened to prosecute them all, probably President Bush as well. President Bush decided to pardon several of them leaving himself, who was the most prominent prosecutable figure.⁴⁸ Several commentators speculated that President Bush might pardon himself for his role in the scandal and many assumed that such an act would be valid.⁴⁹ One of the commentators stated that for the President to pardon himself would, and admittedly, be an unprecedented act but the Constitution does not forbid it.⁵⁰

5.0 The Presidential Power of Pardon in Tanzania

The President of Tanzania is in principle the chief executive of the whole country. His powers and functions are specified in the CURT of 1977 and other laws which are enacted by Parliament. For that the President of Tanzania, like that of the USA has no prerogatives but has only powers granted and functions enjoined by the CURT of 1977.

It is to be noted that by far the CURT of 1977 is akin to that of the USA. So the CURT of 1977 and the constitutional law of the country generally may be interpreted, construed and applied in like manner as the US Constitution of 1787. It means constitutional

⁴⁴ Regulation 1.7 of the Code of Federal Regulations

⁴⁵ Regulation 1.8 of the Code of Federal Regulations

⁴⁶ Kalt, B.C., op. cit, p. 778

⁴⁷ See Proclamation No. 4311, 39 Fed. Reg. 32, 601 (1974)

⁴⁸ Kalt, B.C., op cit

⁴⁹ James Gill, Walsh's Quarry, New Orleans Times – Picayune, Jan 1, (1993), B1

⁵⁰ Kalt, B.C., op cit, p. 779

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law of Tanzania is fundamentally different from that of England although Tanzania legal system draws so much water from England. The differences between the two Constitutions are very obvious. The CURT of 1977 is written whereas that of England is largely unwritten and Tanzania is a country which follows presidential system of government while England follows parliamentary system of government. That being the case it is not wise to proceed on the presumption that the powers of the President of Tanzania are those which are enjoyed by the British Monarchs. It is wholly misleading to presume that the prerogative of the British Monarchs and that of the President of Tanzania is coeval. But it is correct to the large extent to presume that presidential powers and privileges of the President of Tanzania are the same as those of the President of USA. It is therefore, submitted by this article that the right approach is to equate the CURT of 1977 and the US Constitution of 1787 and to argue that the powers and privileges of the President of the USA are the same as the powers and privileges of the President of Tanzania. One of such powers is the presidential power of pardon.

5.1 Scope of the Presidential Pardon in Tanzania

Presidential power of pardon in Tanzania is provided by Article 45 of the CURT of 1977. This provision reads;

“Subject to the other provisions contained in this Article, the President may do any of the following:

- (a) grant a pardon to any person convicted by a court of law of any offence, and he may subject to law grant such pardon unconditionally or on conditions,*
 - (b) grant any person a respite, either indefinitely or for a specified period, of the execution of any punishment imposed on that person for any offence,*
 - (c) substitute a less severe form of punishment for any punishment imposed on any person for any offence, and*
 - (d) remit the whole or party of any punishment imposed on any person for any offence, or remit the whole or part of any penalty of fine or forfeiture of property belonging to a convicted person which would otherwise be due to the Government of the United Republic on account of any offence,*
- (2) Parliament may enact law making provisions for the procedure to be followed by the President in the exercise of his powers under this Article,*
 - (3) The provision of this Article shall apply to persons convicted and punished in Tanzania Zanzibar and to punishments imposed in Tanzania Zanzibar under law enacted by Parliament which applies to Tanzania Zanzibar, likewise such provisions shall apply to persons convicted and punished in Mainland Tanzania in accordance with law.”*

From the words of Article 45 of the CURT of 1977 three words are extremely material. These are punishment, sentence and offence.

The power enshrined in Article 45 of the CURT of 1977 may be used by the President to save a person from the punishment met by the courts after conviction of the offence charged. From Article 45 (1)(a) of the CURT of 1977 it is clear that the punishment which

has to be pardoned by the President of Tanzania must be in respect of an offence, and not for any simple breach of a condition on which a person has been granted. Consequently, unless the context otherwise requires, it is to be taken for granted that the word offence as has been used in Article 45 is in the same sense which has been given to it in the Penal Code.⁵¹ Section 5 of the Penal Code defines offence to mean an act, attempt or omission punishable by law. There is nothing in Article 45 to show that this meaning of the term offence is not intended in Article 45 of the CURT of 1977. Accordingly, the power of pardon has been granted to and the same can be exercised by the President of Tanzania only in respect of an act which, in eye of laws, is an offence.

The pardon is sometimes and in Tanzania known as prerogative of mercy.⁵² As stated above this can be granted by the President of Tanzania to the person who was convicted of any offence. According to Article 45(1)(a) of the CURT of 1977 the President of Tanzania can grant pardon to the person who has been convicted of any offence. This means the presidential power of pardon in Tanzania can be granted even to the convicts of capital offences like treason and murder. It was in exercise of this power that in 1972 Mwalimu Julius Nyerere granted pardon to Bibi Titi Mohamed who was convicted of treason offence.⁵³ In the case of *Hatibu Ghandhi and Others vs. R*,⁵⁴ among the person who was convicted of treason was Captain Zacharia Hanspoppe, who was later on in 1995 released after getting pardon from the President Tanzania. Again in 2017 President John Pombe Magufuli granted pardon to 61 death row convicts. These are clear indications that presidential power of pardon is not limited in terms of offences.

In Tanzania the persons who accept the pardon do not necessarily implicitly confess guilt. It means the person may accept pardon despite the fact that he denies being guilty of the offence convicted. Nguza Viking @ Babu Seya and his two sons were granted pardon by the President of Tanzania despite the fact that they did not confess committing the crime for which they were charged with and convicted of.⁵⁵ This is proved by the fact that despite being given pardon in December 2017 Nguza Viking @ Babu Seya and his two sons continued to prosecute their Application in the African Court on Human and Peoples' Rights until March 2018.

The power of the President of Tanzania to grant pardon is discretionary, final and conclusive and no Appeal can be made against the decision of the President in exercise of power to grant pardon. The pardon, remission and respite as the presidential power of pardon in Tanzania have been entrenched in the CURT of 1977 as a way to supplement judicial justice. This is because it is possible sometimes that through judicial justice a wrong person may be convicted and the real criminal who should be convicted may be discharged or acquitted. The conviction of four members of one family in the case of *Nguza Viking @ Babu Seya and Three Others*

⁵¹ CAP 16 RE 2019

⁵² Read marginal notes to Article 45 of the CURT of 1977

⁵³ See "Tanzania Treason Trial Entering Third Week," the New York Times, 13th July 1970, on line, <https://www.nytimes.com/1970/07/13/archives/tanzanian-treason-trial-entering-third-week.html>, accessed on 13th February 2019, at 2134 hours

⁵⁴ (1996) TLR 12

⁵⁵ See the case of *Nguza Viking and Two Others vs. the United Republic of Tanzania, Application No. 006 of 2015, the African Court on Human and Peoples' Rights, Arusha, (Unreported)*

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10523>

vs. the Republic,⁵⁶ raised outcry of many citizens of Tanzania and in most instances it was believed that the four were wrongly charged and convicted. In December 2017 President John Pombe Magufuli granted pardon to the family as a sign of social justice. The pardon is also one of the ways of decongesting the prisons in the country.

5.2 Self Pardoning Power in Tanzania

The President of Tanzania is granted the power of pardon with the view to save a person from the consequences of punishment adjudicated by inadvertence or mistake against that person by the courts which being a human institution is likely to error. This being the case, the question of the President granting pardon to a person who has not been convicted of an offence does not arise. If a person, who affirms that he is innocent, is nevertheless granted pardon by the President of Tanzania he can well retort that since he has not committed any offence, so the question of the President granting him a pardon does not arise at all.

In Tanzania it is conceived that the CURT of 1977 is silent on self pardoning. Again in Tanzania the incumbent President cannot be prosecuted for any offence as he has immunity.⁵⁷ This therefore, suggests that the President of Tanzania does not have self pardoning power. This view is taken basing on a legal position that in Tanzania, pardon is granted after a person has committed offence and has been convicted by the courts. Since the sitting President in Tanzania has immunity he cannot be convicted by the courts. This paper argues that the President of Tanzania therefore cannot pardon himself as he cannot be prosecuted and convicted by the courts. Thus the absence of specific provision in the CURT of 1977 allowing self pardoning implies that the CURT of 1977 proscribes self pardoning.

5.3 Procedure for Exercising Power of Pardon in Tanzania

In exercising the presidential power of pardon the President of Tanzania is guided by the CURT of 1977, the Presidential Affairs Act⁵⁸ and the Criminal Procedure Act.⁵⁹ Article 45(2) of the CURT of 1977 gives power to the Parliament to make law for the procedure to be followed by the President in exercising the presidential power of pardon. Pursuant to this the Parliament has enacted the Presidential Affairs Act which inter alia has provisions related to the exercise of power of prerogative of mercy cum the presidential

⁵⁶ *Criminal Appeal No. 56 of 2005, Court of Appeal, Dar es Salaam, (Unreported)*

⁵⁷ Article 46 of the CURT of 1977

⁵⁸ CAP 9 RE 2002

⁵⁹ CAP 20 RE 2019

power of pardon. Section 3(3) and (4) of the Presidential Affairs Act requires the President of Tanzania to obtain from or consult the Advisory Committee of Prerogative of Mercy (ACPM) before he exercises his powers conferred by Article 45 of the CURT of 1977.

The ACPM is a body which is established by section 3(1) of the Presidential Affairs Act. The major function of the ACPM is to advise the President of Tanzania on exercising of the power of pardon. The ACPM is entirely different and separate from other bodies which are established by other laws but which have somehow similar functions. For that the ACPM is different from the Parole Boards and the Community Service Committees which administer parole, community service or substituted sentence. The Parole Boards are established by the Parole Boards Act⁶⁰ while the Community Service Committees are established by the Community Service Committees Act.⁶¹ Likewise the ACPM is not appellate body for those who are not granted pardon by the President of Tanzania or who are not granted parole, community service or substituted sentence.

The composition of the ACPM is provided by section 3(1) (a), (b) and (c) of the Presidential Affairs Act. According to this provision the members of the ACPM are the Minister of the government, the Attorney General and other members who shall be not less than three and not more than five. All the members are appointed by the President of Tanzania. This paper suggests that the other members should be the Commissioner General of Prison Services, the Chief Medical Officer, the Director General of the Tanzania Intelligence and Security Service, the Chief of Defense Forces, the Chief Justice and the Commissioner for Social Welfare.

The Minister of the government is the Minister responsible for Constitutional and legal affairs. This is the member because exercise of prerogative of mercy is a constitutional and legal affair. The Attorney General is the member in order to render legal advice to the President and the Minister. The Commissioner General of Prison Services may be needed in order to advise the President of Tanzania on appropriate convicts to be considered for pardon, respite or remission. He is apposite person to give such advice as he is the one who keeps the convicts. The Chief Medical Officer may be needed to advice on health matters as some of the convicts are health cases. The Chief Medical Officer shall give good advice on the convicts to be considered for pardon, respite or remission basing of health history of the convict. The Director General of Tanzania Intelligence and Security Service and the Chief of Defense Forces are very important to advise the President of Tanzania based on national defense and security considerations. The convict to be granted pardon may be threat to the national security and defense. The Chief Justice is the chief of the judiciary and thus represents the judges who convicted the offenders. His opinion on a suitable person to be granted pardon by the President may be sound and is invited to give the position of the courts on the persons considered for pardon. The Chief Justice therefore may advise on complexity of the case weight of the evidence used to convict the person and other related legal and procedural issues in respect of the persons who are considered to receive pardon. The Commissioner for Social Welfare is the person responsible for provision of social welfare for

⁶⁰ CAP 400 RE 2002

⁶¹ Act No. 6 of 2002

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individuals, families and people with special needs. The Commissioner for Social Welfare is therefore important to advise the President on suitability of the person for grant of pardon basing on social welfare backgrounds of the person.

The meetings of the ACPM to deliberate on the advice to give to the President of Tanzania shall be convened by the President himself. Where possible all the meetings of the ACPM shall be presided over by the President of Tanzania.⁶² So in Tanzania the President effectively controls the whole process of presidential power of pardon. The President of Tanzania appoints the members of the ACPM, summons the meetings, presides over the meetings and determines the procedure.⁶³ This is so because there are no guidelines of procedures yet for the exercise of presidential power of pardon.⁶⁴ This paper argues that the scheme is so purposely designed since pardon power is considered as ‘pure mercy function’ and thus needs to be closely supervised by the President himself. More so even if the President of Tanzania controls the whole process it is important to have the ACPM so that to avoid abuse of power by the President. This means despite being weak as it may be argued the ACPM ameliorates possibility of the President of Tanzania to abuse his prerogative powers.

According to section 3(3) of the Presidential Affairs Act the President of Tanzania shall grant pardon, respite or remission to the convict of murder after obtaining advice from the ACPM. The obtaining of the advice prior to exercising of the power thereof is mandatory, failure of which shall render the exercise illegal. Although the President of Tanzania is bound to obtain advice of the ACPM before he pronounces pardon, respite or remission to any death row inmate or other convicts the President is not bound to follow the advice thereof. Section 3(3) of the Presidential Affairs Act reads that;

“Where any person has been sentenced to death (otherwise than by a court-martial) for any offence, the President shall cause a written report of the case from the trial judge or magistrate, together with such other information derived from the record of the case or elsewhere as he may require, to be considered at a meeting of the Advisory Committee; and after obtaining the advice of the Committee, **the President shall decide in his own deliberate judgment whether to exercise any of his powers under section 45 of the Constitution.**” (Emphasis added).

From the words of section 3(3) of the Presidential Affairs Act there are two major things which are important to note. First if the prerogative of mercy is to be exercised in respect of the person who was convicted by the court martial the ACPM shall not be involved. Instead the President of Tanzania shall have to receive advice from the Minister responsible for defense and national security. Second the President of Tanzania is not bound to follow the advice of the ACPM or of the Minister responsible for defense and national security. It means whatever advice the President of Tanzania receives from the ACPM or the Minister responsible for defense and national security as the case may be the decision as to whether to grant pardon, respite or remission remains in the

⁶² Section 3(1)(c) of the Presidential Affairs Act

⁶³ Section 3(5) of the Presidential Affairs Act

⁶⁴ See argument of Counsel Rweyongeza in the case of *Mbushuu alia Domini Mnyaroje and Another vs. Republic (1995) TLR 97, p. 107*

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discretion of the President himself, the discretion which, of course, shall have to be prudently exercised, giving regards to reasonable grounds.

While it is mandatory for the President of Tanzania to obtain the advice of the ACPM if pardon is to be exercised to the murder convicts, the President is not bound to seek and receive advice in exercising the power if the prisoner is other than murder convict.⁶⁵ So for other convicts the President of Tanzania may exercise his powers without even consulting the ACPM, let alone to follow its advice.

5.5 Commonplace of Presidential Pardon in Tanzania

Constitutionally the President of Tanzania has and may exercise presidential power of pardon. This power has been in the CURT of 1977 since 1984 following the fifth constitutional amendments.⁶⁶ While in USA the presidential pardon power is said to take atropism pace President John Pombe Magufuli is not reticent. The reason for him to be active in exercising presidential pardon power is because there is high rate of imprisonment of people by courts. Again it is a fact that imprisonment stigmatizes those convicted of crime.⁶⁷ One way to remove the stigma to the convicts is by releasing them on presidential power of pardon.

As such the pardon power has been exercised by all five Presidents of Tanzania (Mwalimu Julius Nyerere, Ali Hassan Mwinyi, Benjamin Mkapa, Jakaya Kikwete and John Pombe Magufuli) ever since independence in 1961 until now. Two major events within recent years in which President Magufuli granted pardon to the family members of Babu Seya and to the murder convicts, have underscored significance of the presidential power of pardon in Tanzania. However, despite widespread publicity over these two specific case instances, the pardon power in general still remains only superficially understood by most citizens. It is therefore the purpose of this article to be educative as to the practical evolution of the President's pardoning powers, and in so doing to ascertain the scope and legal implications inherent in such executive act of pardon.

6.0 Conclusion

From the above analysis it is fare to conclude this article by arguing that the presidential power of pardon is very wide. It seems it is the intention of the Framers of the Constitutions in the countries which follow presidential system of governments to provide for such plenary powers. It also seems that it was the intention of the Framers to provide such wide power without putting limitations to check its exercise. At times, the Framers seemed to think that impeachment is the appropriate remedy or check for abuse of the presidential pardoning power. This can be proved by the ways the US Constitution of 1787 and the constitutional law of England, in relation to

⁶⁵ Section 3(4) of the Presidential Affairs Act

⁶⁶ See Article 9 of the Fifth Constitutional Amendment of 1984, Act No. 15 of 1984

⁶⁷ Love, M. C., op cit, p. 1191

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pardoning power and impeachment are intertwined. Despite such checks which are impliedly provided by the impeachment, USA and Tanzania jurisprudences and experiences have shown that there is unbridled of the pardoning power. This then proves one thing, which is legal limitations on exercise of the presidential power of pardon are few. As a result there is a potential possibility of abuse of the power by the Presidents or head of States. One of the possible abuse may be self pardoning, which albeit its non-occurrence so far, there are more than plenty signs of possibility of its occurrence in a near future. Another possible abuse may be in relation to granting of pardon by the President or head of State to persons in order to protect themselves from possible legal jeopardy or embarrassment. Because of all this it is high time now than ever before for the Constitutions of the States to insert explicit provisions through constitutional amendments which shall provide for control, limitations and checks on exercise of the presidential power of pardon.

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Age and Gender Differences in Achievement Motivation: A Ghanaian Case Study

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DOI: 10.29322/IJSRP.10.09.2020.p10524
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10524>

Abstract - This work sought to investigate achievement motivation among senior high school students at the University Practice Senior High School, Cape Coast. A quantitative research design was employed. In all a sample of 293 students were selected for the study based on a systematic random sampling technique. A questionnaire with reliability coefficient of 0.825 was used for the study.

Three hypotheses were tested to know whether differences existed between younger male adolescents and older male adolescents; younger female adolescents and older female adolescents; male, and females adolescents in their achievement motivation. The study concluded that no significant differences existed regarding the three hypotheses. In other words, the null hypotheses in all the three cases were confirmed. The study thus, recommended among others that achievement motivation training should be taken seriously for both genders in order to maintain the current trend.

Index Terms – Achievement, Motivation, Gender, Ghana, Education.

I. INTRODUCTION

The issues of motivation of students in education and the impact on academic performance are considered as important aspect of effective learning. A learner's sustained commitment to learning is an important measure of his or her success. It is in this light that Hall (1989) suggests that there is a need to motivate pupils so as to arouse and sustain their interest in learning. Nakata (2006) on a study of the importance of motivational factors for English language learning observes that motivation is largely responsible for determining human behavior and thus those who are really motivated to learn a foreign language will be able to become proficient to a certain degree. Self-determination theorist identifies two broad categories of motivation: namely intrinsic and extrinsic motivation (Deo, 1985). Intrinsic motivation as an activity or behavior engaged in voluntarily for the inherent pleasure and satisfaction derived from participation. In contrast, extrinsic motivation refers to activities engaged in to receive a reward or to avoid being criticized (Baker, 2004, p. 189). Intrinsic and Extrinsic Motivation together provides the basis for understanding achievement motivation which is considered a key determinant of educational outcomes (Lemos, 2014).

Achievement motivation is a theoretical model intended “to explain how the motive to achieve and the motive to avoid failure influence behavior in a situation where performance is evaluated against some standard of excellence” (Atkinson, 1957: 371).

Murray (1938) used the term first and she associated it with a range of actions including intense, prolonged and repeated efforts to accomplish something difficult; to work with singleness of purpose towards a high and distant goal; to have the determination to win; to try to do everything well; to be stimulated to excel by the presence of others; to exert will power; to overcome boredom and fatigue (Murray, 1938). More recent expositions on achievement motivation have defined achievement motivation as reaching success and achieving all of aspirations in life (Harackiewicz, Barron, Carter, Lehto, & Elliot, 1997).

In this light achievement motivation is viewed as the attitude to achieve rather than the achievements themselves. Individuals will satisfy their needs through different means, and are driven to succeed for varying reasons both internal and external. Factors that may explain

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Individuals achievement motivation are broadly classified by theorist into achievement motive and achievement goals. Achievement motives include the need for achievement and the fear of failure. These are the more predominant motives that direct our behavior toward positive and negative outcomes. Achievement goals are viewed as more solid cognitive representations pointing individuals toward a specific end. Achievement motives can be seen as predictors of achievement circumstances rather than providing a direct basis for achievement. Thus, achievement motives are said to have an indirect or distal influence, and achievement goals are said to have a direct or proximal influence on achievement-relevant outcomes (Elliot & McGregor, 1999). Examples of achievement goals include: a performance-approach goal, a performance-avoidance goal, and a mastery goal. A performance-approach goal is focused on attaining competence relative to others, a performance-avoidance goal is focused on avoiding incompetence relative to others, and a mastery goal is focused on the development of competence itself and of task mastery (Ibid).

Achievement motivation is an important issue for psychologists and individuals in the field of education because it has been correlated with academic self-concept (Marsh & Hau, 2003), academic self-efficacy (Bong & Skaalvik, 2003), learning and performance goals (Hsieh et.al, 2008), developmental level (Guay, Marsh, & Boivin, 2003), and gender differences (Mandel & Marcus, 1988). Research on achievement motivation in the schools suggests a relationship with moral reasoning, behavioral problems, intrinsic motivation, apathy, and teacher burn-out rates (Timms, et.al 2007; Walsh, 2006).

The focus of the current research project is on differences in achievement motivation based on gender and age among younger and older adolescents within the senior high school as well as the dominant factors that affect. Using the University Practice Senior High School; a medium size high achieving urban school as the setting, the work attempts to examine how male and female as well as old and young adolescents differ on achievement motivation broadly viewed. Studies on whether or not differences exist among young people in achievement motivation have been generally inconclusive. This work seeks to explore the question within the Ghanaian context in a bid to add further insight to this area of research. The work thus revolves around three main objectives namely:

- a) To investigate the differences in achievement motivation among younger and older adolescents males in the Senior High School
- b) To investigate the differences in achievement motivation among older and younger adolescent females in the senior high school
- c) To investigate the differences in achievement and motivation among males and females in the senior high schools

II. STATEMENT OF THE PROBLEM

Research shows that, low test scores, low grades, high school drop-out rates, poor attendance, and low motivation usually top the list of the reasons why students fail in high school (Noguera, 2003). High achievement motivation among high school students in general is linked to reduced school dropout rates and increased levels of academic success (Alspaugh, 1998; Caldwell, 2007; Chmelynski, 2004; Haycock, 2001). Everyone is motivated by something (Eccles, Wigfield, & Schiefele, 1998; Hootstein, 1998). The question remains as to whether gender and age accounts for high or low achievement motivation among adolescent students in the Senior High Schools.

Past research has indicated that males and females are likely to score differently on various aspects of academic motivation. These gender differences are apparent within intrinsic (McGeown et al., 2012) and extrinsic (Rusillo et al., 2004) attributes, learning strategies (Massachi, 2000), and hours devoted to studying (Trautwein & Ludtke, 2007). Autonomous motivation was also found to mediate the relationship between self-concept and achievement in a sample of 925 high school students (Guay et al., 2010). However, much of this research is domain specific as it measures motivation towards a particular task area (e.g. motivation towards learning a foreign language). This, in turn, limits its usefulness in explaining students' holistic motivation, i.e. regardless of subject or task. It is also imperative to note that much of the previous research has been conducted among students residing in educational contexts that precede senior high school education and in the developed countries or transitional economies.

There is therefore a void in the literature that focuses on the Achievement Motivation characteristics of senior high school students in Ghana. If achievement motivation is linked to academic persistence and reduced dropout rates and senior high school is a pivotal transition year, then we ought to explore these phenomena and attempt to understand the key differences that exist across gender and age in achievement motivation. The present study uses a descriptive quantitative method to describe differences in achievement motivation among senior high school students in the University Practice Senior High School (UPSHS), Cape Coast with specific reference to age and gender as independent variables.

III. RESEARCH HYPOTHESIS

- Ho1. There are no significant differences in the levels of Achievement Motivation between younger male and older male Adolescents in the Senior High School?
- Ho2 There are no significant differences in the levels of Achievement Motivation between younger and older adolescents?
- Ho3 There are no significant difference in the levels of achievement motivation between male and female adolescents

IV. RELATED LITERATURE

A. *The Concept of Achievement Motivation*

Within his framework to understand achievement motivation, McClelland (1961) proposed that regardless of culture or gender, people are driven by: achievement, power, and affiliation. He proposed that these needs were socially acquired and the extent to which these motivators are learned varies from person to person, and depends on the individual and his or her background (Butler, 2014). Achievement Motivation Theory recognizes the need for Achievement, the need for Power, and the need for Affiliation as common themes to explain and predict behavior and performance acquired during an individual's lifetime (Ibid). The need for achievement is characterized by the wish to take responsibility for finding solutions to problems, set goals and get feedback on levels of success.

McClelland (1961) described the need for Achievement as victory or accomplishment with some standard of excellence. Phelan and Davidson (1994) explained the need for achievement to be an unconscious concern for excellence through a person's efforts.

B. *Sex Differences*

There are numerous studies on sex differences in achievement motivation at school in the literature of psychology. One of the earliest studies was conducted by Morris (1959) which referred to the psychic and social differences between sexes. The study concluded that the education outcomes of men and women will, at least in part, be different at the graduate and collegiate level.

Mackintosh (1998) claimed that there is no sex difference in general intelligence. He defined general intelligence as the reasoning ability and its best measure is the Progressive Matrices. After examining two tests administered by the Israeli Defense Forces which qualify IQ, Flynn (1998) finds no sex difference. Kimball (1989) finds that in contrast to standardized measures of mathematics achievement tests like SAT-M, female students outperform males in math classes.

There is more literature that supports the differences position. For example, Cartwright et al. (2013) reported that intrinsic motivation is related to significantly greater levels of academic achievement for male, but not for female students. However, the generalizability of these particular findings appears limited due to the use of a small sample size, and specific focus on physiology students.

In a study with 419 Italian students, Vecchione et al. (2014) revealed that the predictive value of intrinsic motivation on academic outcome tended to be stronger for females, whereas the impact of extrinsic motivation was stronger for males. However, given the paucity of studies in the area, research with more diverse student populations is warranted.

Another study investigated eight different types of goal orientations to determine predictability of academic achievement (Giota, 2002). Participants in this study consisted of 7,391 students who were part of a longitudinal Swedish project called "Evaluation through Follow up." The investigator examined male and female students in grades 6 and 8. The results revealed that there were gender differences in the types of goals for which males and females strived in school. More specifically, they found that girls were more likely than boys to score higher on academic achievement in language. Boys were more likely than girls to score higher on domain-specific mathematics/science.

Linenbrink and Pintrich (2002) examined research pertaining to student motivation and four key components that included academic self-efficacy, attributions, intrinsic motivation, and achievement goals. Males and females were found to have different competence-related beliefs during childhood and adolescence (as cited in Wigfield & Eccles, 2002). Results revealed that boys had higher competence beliefs in sports activities and math compared to girls.

Other researchers have investigated gender differences in future orientation and motivation (Greene & DeBacker, 2004). This meta-analysis examined differences in orientation and motivation across several studies. They concluded that females typically pursue a greater array of goals compared to males. The researchers believe that this is possibly due to the modern Western culture of women in the workforce and pursuing more jobs that were once held exclusively by males. The researchers suggested that female students are more affected by fear of failure than males. They indicated that this fear of failure creates anxiety and likelihood of withdrawing before obtaining a goal. They concluded that the school setting plays a role in the type of motivation that males and females maintain.

In studies in which researchers specifically examined self-evaluative bias, boys showed more positive bias in math than did girls (Dupeyrat, Escribe, Huet, & Regner, 2011). Similarly, males overestimated and females underestimated their numerical, spatial, and

general intelligence (Steinmayr & Spinath, 2009). These patterns have been linked to culturally transmitted gender roles and expectations that orient boys to be both more confident and more motivated to succeed in what are perceived as gender-appropriate domains (Eccles, Jacobs, & Harold, 1990; Nagy et al., 2010).

Carr and Mednick (1988) tend to lend support to the afore-stated view that culture linked to childhood socialization may explain gender differences in achievement motivation. In a study of ninety seven boys and one hundred girls they found that socialization practices have different effects on Achievement motivation depending on who is been nurtured. Their study revealed that Nontraditional sex role training led to higher achievement motivation for girls and traditional sex role training led to higher achievement motivation for boys.

In another study, researchers examined gender differences in achievement motivation while evaluating the psychometric properties of the Academic Motivation Scale (Cokley, Bernard, Cunningham, & Motoike, 2001). Participants in this study consisted of 263 undergraduate psychology students at a Midwestern University. The instrument used to assess academic motivation was the Academic Motivation Scale, which measures intrinsic, and extrinsic, motivation. No gender differences were found in this study, and only partial support for the construct validity of the instrument was found. The primary finding was that individuals with a high academic self-concept had more of an internal locus of control. They concluded that these individuals are more intrinsically motivated than extrinsically motivated.

Gower, Cole and Philips (1987) investigated gender differences in undergraduate psychology students at Texas Christian University. Twenty eight males and twenty four females participated in a game called Prisoner's Dilemma. Males and Females used different strategies to play the game. The findings were that achievement motivation could not adequately explain differences in game behavior. The researchers thus concluded "Regardless of gender, some individuals in a competitive situation are motivated by a desire to avoid losing" (Gower, Cole & Philips, 1987.p4). Other researchers have found that when females begin to reach adolescence, they feel the need to conform to female gender roles (Basow & Rubin, 1999). Gender roles for both males and females begin to intensify starting in early adolescence due to internal and external forces that require adjustments. Such adjustments include physiological, psychological, and social changes that male and female adolescents endure that influence the formation of an adolescent's self-esteem, self-competency, and perceptions. The authors suggested that these adjustments may lead to different focuses in achievement motivation for males and females.

In summary, the research on gender differences in achievement for males and females has resulted in inconsistent findings. Some researchers have found no difference (e.g., Ligon, 2006), whereas others have found differences (e.g., Vermeer, Boekaerts, & Seegers, 2000).

C. Age and Achievement

Research suggests that age play a role in achievement motivation. Academic self-concept as a construct of achievement motivation, is thought to change with developmental levels such that younger children's academic self-concept is centered more on internal factors (Guay, Marsh, & Boivin, 2003). For example, younger children are more motivated intrinsically to complete their homework or to study for a test (Ibid). As children get older, they are more likely to have academic self-concepts that are influenced by external factors such as rewards or incentives. This means younger children's motivation may change as they move from pre-adolescence to adolescence (Ibid).

As children enter different academic settings, it could also be that the demands change and children are reinforced differently by teachers (Ibid). This study included three cohorts of French-Canadian children (N=385) in grades 2 through 4. The participants' academic self-concept was measured. Academic achievement was measured by the questionnaire that the teachers completed. The results indicated that as these children become older, their academic self-concept responses become more strongly correlated with academic achievement (Ibid).

Researchers specifically examined different domains related to achievement and self-competence in children (Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002). Notable, were the researchers' findings concerning self-perceptions of competence. They found that self-perceptions of competence and subjective task values declined with age. This suggests that the decline in self-perceptions is more of a downward trend rather than a leap in self-perceptions relating to achievement. They also found that self-perceptions of competence are related to the value of the activity in school.

Other researchers studied the impact of student transitions of 7th, 9th, and 11th graders on motivational tasks (Yeung & McInerney, 2005). The study consisted of 199 high school students from Hong Kong with the ages ranging from 12 through 18 years of age. Motivation was assessed using scales with four specific domains that measure task, effort, competition, and praise orientation. The scale was tested for validity by applying a structural equation modeling analysis. The study found that 7th graders scored significantly higher on task and effort scores than the other grade levels. They concluded that overall student motivation drops after 7th grade. Therefore,

effort motivation begins to drop around adolescence. The researchers found that competition and praise orientation declined consistently across the grades.

Another study examined adolescents' academic orientations during their high school years (Crosnoe, 2001). The participants were from nine high schools and completed two questionnaires in which covered social, educational, and psychological factors. Results of the longitudinal study indicated that the students first began high school with moderate level of academic orientation, but experienced significant declines in academic orientation over the period they were in high school. Studies examining age-related changes in achievement goal orientations in children and adolescents focus on developmental and contextual theories to explain changes in goal orientations (Wigfield & Cambria, 2010). Developmental theorists (e.g., Nicholls, 1990) posit that younger children, especially those in elementary schools, are unable to distinguish the difference between ability and effort. In the elementary school years, students believe that intelligent students are those making a great deal of effort. However, with cognitive development, older students easily segregate effort and ability and believe that students who try to exert a lot of effort to accomplish a task are in fact less intelligent. Other developmental theorists (Dweck & Legge, 1988) make a distinction related to students' ability or intelligence views. According to Dweck and Leggett (1988), students have two different views about their abilities, namely entity and incremental views.

Developmental theorists (Dweck & Leggett, 1988; Nicholls, 1990) also posit that although students generally begin elementary school with mastery goal orientation, they become progressively more performance oriented as they move through upper grades. Theorists focusing on contextual variables take into account the instructional contexts and how they can affect students' goal orientations in schools (Wigfield & Cambria, 2010). Researchers specifically emphasized the difference in classroom and school goal culture to explain the reasons for changes in achievement goal orientations (Meece, Anderman, & Anderman, 2006). Specifically, a school environment emphasizing improving skills and learning may positively affect some students' master achievement goals and motivation, whereas school environments focusing on competition and demonstrating skills that are superior to those of other students may make some students more performance oriented and decrease their motivation (Meece, Anderman, et al., 2006).

Cross-sectional studies examining age-related differences in divergent student cohorts have shown that elementary school students were higher in mastery approach goal orientation than middle school students (Leondari & Gialamas, 2002) or showed no difference (Liu, 2003), and middle schools students were also higher in mastery goal orientation than high school students (Gonida, Kiosseoglou, & Voulala, 2007). With respect to performance approach goals, similar to mastery goal orientations, researchers found that middle school students were higher in performance approach goals than high school students (Gonida et al., 2007). Performance avoidance goals also tend to lessen between middle school and high school (Leondari & Gialamas, 2002).

However, there are at least two obvious limitations in the studies mentioned above. They compared students from different educational levels, such as junior high school, middle high school, and senior high school. However, students' achievement goal orientations may change within a school year or across specific education levels as a function of age (Dweck & Leggett, 1988). Secondly, because these studies included individuals of different developmental stages, such as early (Liu, 2003), middle, or late adolescence (Gonida et al., 2007), they may overlook specific changes within specific developmental stages, such as middle adolescence.

Differences in results cannot only be attributed to sample differences (Meece, Glienke, & Burg, 2006) and/or divergent assessment instruments (Dekker et al., 2013), but may also indicate social, cultural, and contextual factors at work. Taken together, much of the available evidence on age differences is inconsistent and requires further investigation. Other researchers investigated achievement motivation changes over time and the perception of academic setting factors in order to determine influences of academic outcomes (Wilkins & Kuperminc, 2010). The participants of this study included 143 Latino adolescents. Results revealed 8th grade students reported an increase in mastery-approach achievement motivation within an academic setting that was task-focused as they transitioned to high school.

Ligon (2006) studied achievement motivation of 175 males and females in elementary, junior high, and high school from a white, middle-class, suburban school district in New York. The participants in this study were selected from the 4th, 7th, and 10th grades. Ligon wanted to specifically analyze differences in students' levels of achievement motivation based on gender and developmental level. The study used the Achievement Motivation Profile (AMP), Achievement Motivation Profile Jr. (AMP Jr), and the Student's Perception of Achievement Motivation Question. The results of the study indicated that achievement motivation across developmental level was significant. Drawing from the inconclusive nature of the theoretical and empirical literature we expected that there would be no significant differences between girls and boys in achievement motivation and also between younger adolescents and older adolescents in their achievement motivation.

V. RESEARCH METHODOLOGY

A. Research Design

This work employed a survey research design. The choice of this design was to enable the researcher make inferences about the study population based on the selected sample. Given the limited time the researcher had to complete this dissertation it was apparent that reaching the entire population for this study will be very demanding. The survey method provided the fastest and cost effective means of obtaining information from the selected sample. A close ended questionnaire design based on a standardized scale was used to elicit response from the sample.

B. Sampling Setting

The sampling area of this study was the University Practice Senior High School, Cape Coast. The school is located in the central region of Ghana and is currently one of the most highly populated schools with a population of 1817. The school is a co-educational school and has been in existence since 1976. It is currently run by the Ghana Education Service as a category B school. At the time of conducting this study, the final year students were writing their WASSCE and were therefore not included in the study population. The total study population therefore comprised first and second year students whose number in total was 1244.

C. Population and Sample

The total population of the University Senior High School, form one's and forms two's consisting of 526 males and 718 females. Breakdown of population by form and gender can be found in tables 1 and 2.

Table 1: Breakdown of Population by Form and Gender

FORM	GENDER		TOTAL
	MALE	FEMALE	
ONE	276	394	670
TWO	250	324	574
TOTAL	526	718	1244

Source: University Practice Senior High School 2017/2018 academic year records

Table 2: Breakdown of population by gender and class

CLASS	FORM ONE		FORM TWO	
	MALE	FEMALE	MALE	FEMALE
General Arts	113	176	98	143
General Science	57	52	41	41
Business	58	30	58	24
Home Economics	5	88	-	88
Visual Arts	6	37	33	14
Agricultural Science	37	11	20	14

Source: University Practice Senior High School 2017/2018 academic year records

A sample of 293 from the University Practice Senior High School from the population of first and second year students as shown in Table 2 participated in the study. A representative sample of the population was obtained using Krejcie and Morgan (1970) Sample Size Calculation.

D. The Research Instrument

A questionnaire was used in the study. The instrument was a 50 item questionnaire with all questions closed ended. It was adapted from DEO-MOHAN's Achievement Motivation (n-Ach) Scale (DMAMS) (1985). Thirteen (13) of the fifty (50) items were negative and 37 were positive items. Responses were made on a 5 point Likert scale. A positive item carries the weights of 4,3,2,1 & 0 respectively for

the categories of always, frequently, sometimes, rarely and never. The negative items were scored reversely i.e. 0,1,2,3 & 4 for the same categories.

VI. RESULTS AND DISCUSSION

A. Introduction

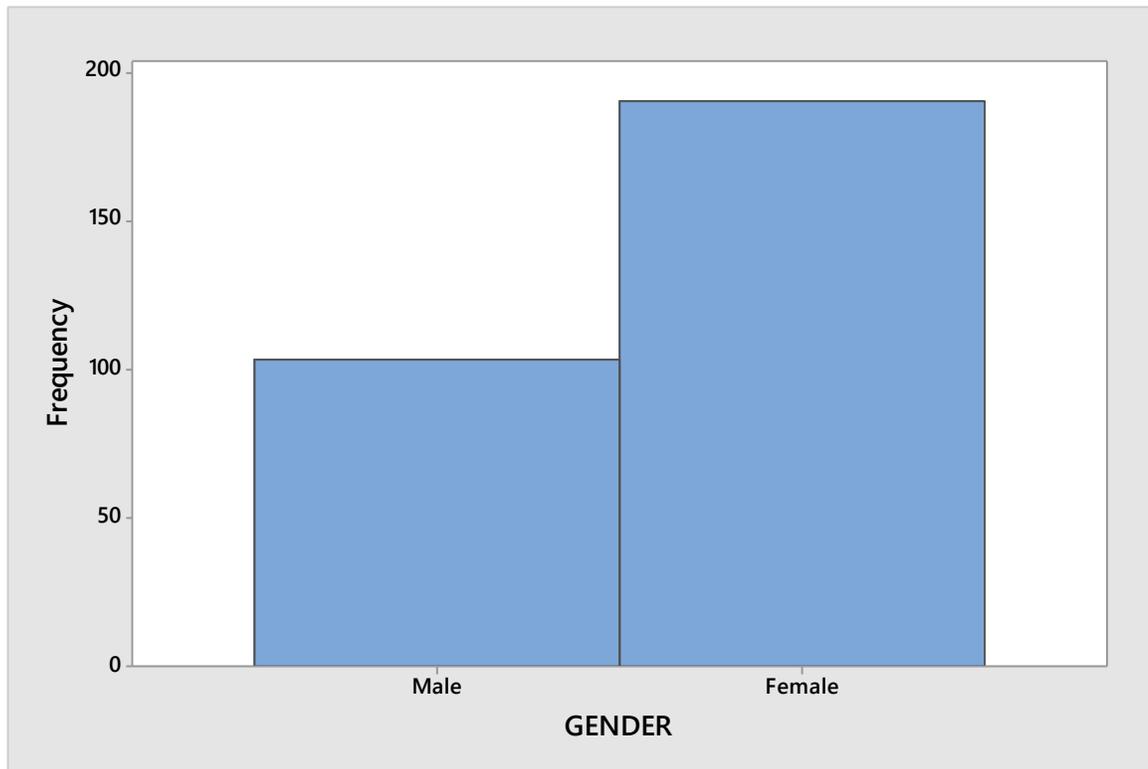
This chapter describes the analysis of data collected. The findings relate to the research hypothesis that guided the study. Data was analyzed to identify, describe and explore the differences between older and younger adolescents and male and female adolescents in their achievement motivation. Data from 293 students was used for data analysis using the Analysis of Variance (ANOVA).

B. Demographic Relationships and Study Variables

This set of data was intended to describe demographic variables of the sample and to assess for any influence on the research findings. The demographic data consisted of age, sex, and class of respondents.

The gender of respondents was sought to enable the researcher ascertain gender distribution of the older and younger adolescents. The result is pictorially displayed in Figure 1.

Figure 1: Proportion of Male and Female respondents

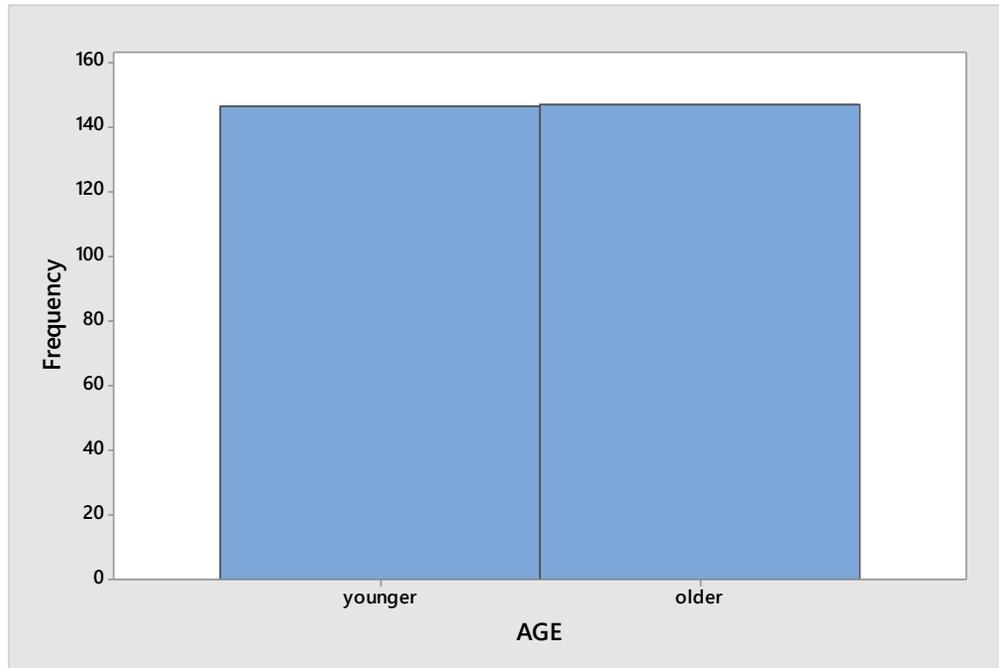


Source: University Practice Senior High School 2017/2018 academic year records

From Figure 1, it can be observed that the number of female respondents outweighed that of their male counterparts. About one hundred and two of the respondents were male while the female respondents were one hundred and eighty-nine. This establishes the point that the University Practice Senior High School has a greater number of female students than males.

The age of respondents was sought to find out the age distribution of adolescents. The results are displayed in Figure 2.

Figure 2: Distribution of Age of respondents



Source : University Practice Senior High School 2017/2018 academic year records

From Figure 2, it can be seen that the number of older adolescents' respondents slightly outweighed the younger adolescent respondents in the study. Whilst 146 younger adolescents took part in the study representing 49.8%, 147 older adolescents took part in the study representing 50.2% of the respondents.

This part sought to ascertain the number of respondents by both age and gender. The distributions of the four categories of independent variables used for this study are presented, namely: younger male adolescents, younger female adolescents, older male adolescents and older female adolescents. Table 3 and Figures 3, 4 and 5 describe this relationship.

Table 3: Age and Gender Distribution of Respondents

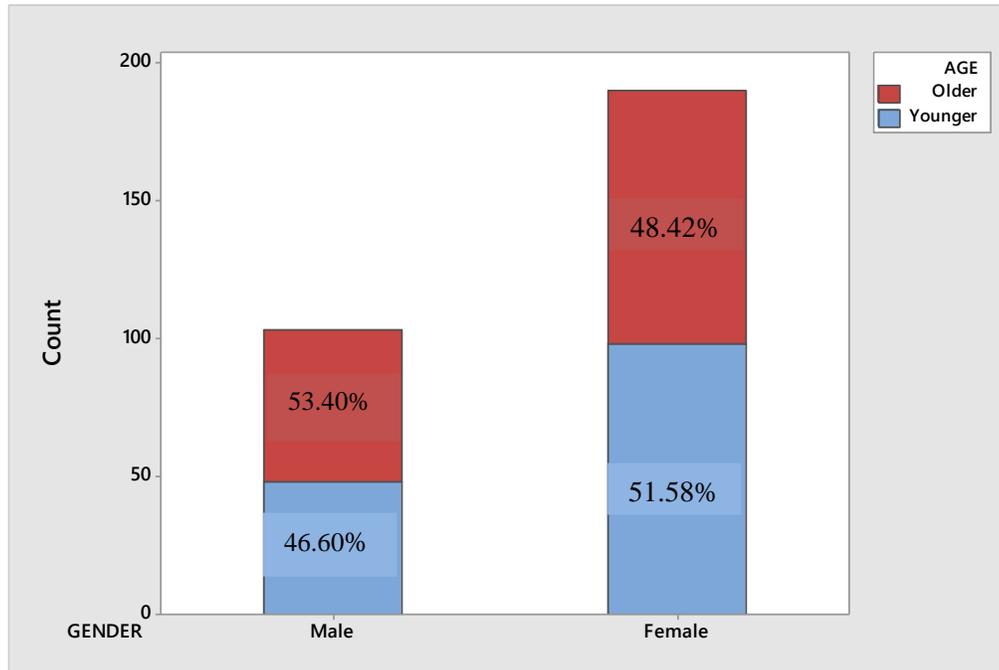
	N	Minimum age	Maximum age	Mean Age	Std. Deviation
Young male	48	14	16	14.88	0.789
Older male	55	17	19	17.98	0.991
Young female	98	14	16	14.79	0.777
Older female	92	17	19	17.99	0.908

Source: University Practice Senior High School 2017/2018 academic year records

From Table 3, it is seen that there were forty-eight (48) younger adolescent males and fifty-five (55) older adolescent males. It is also observed that the younger adolescent females were ninety-eight (98) whilst the older adolescent females were ninety-two (92). The age

range for younger adolescent males was 14 to 16, that for older adolescent males was 17 to 19. The age range for younger adolescent females was similarly 14 to 16 and that for the older female adolescents was 17 to 19.

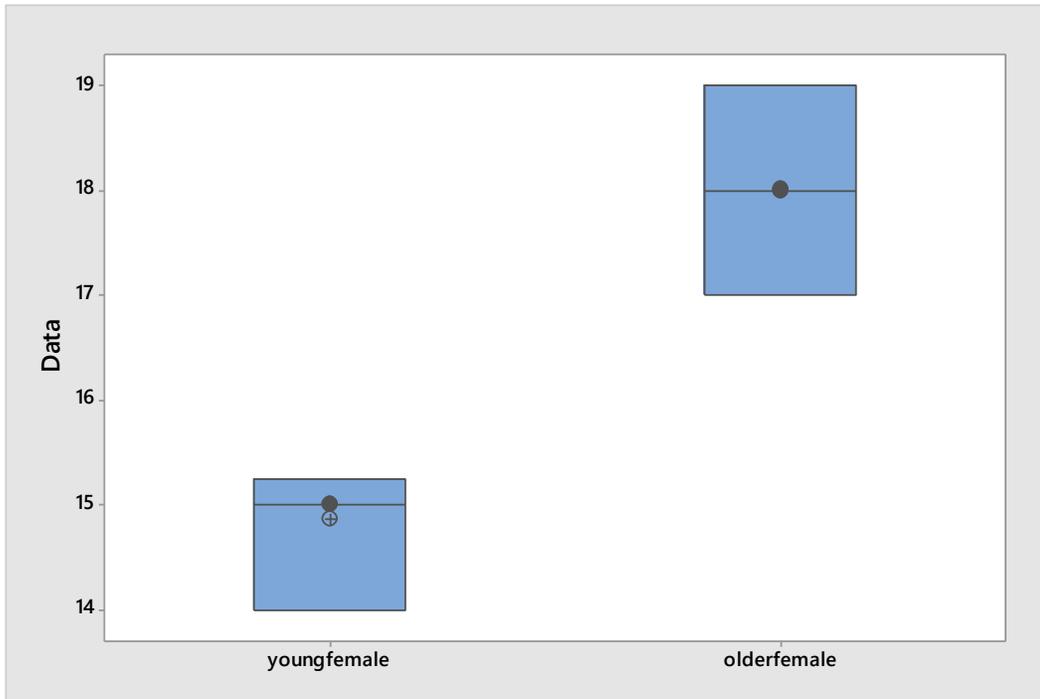
Figure 3: Percentage Distribution by Age and Gender



Source: University Practice Senior High School 2017/2018 academic year records

From Figure 3, it can be detected that about forty-seven percent (46.60%) of young males adolescents took part in the study while about fifty-three percent (53.40%) were older male adolescents. Likewise, it could be observed that, about fifty-one percent (51.58%) of young female adolescent participated in the study while about forty-eight percent (48.42%) were older female adolescent. Again, from Figure 3, it could be observed that out of one hundred and forty-seven (147) older adolescents who took part in the study, about sixty-two percent (62.59%) were females and about thirty-seven percent (37.41%) were males. This means that a greater number of older male adolescents took part in the study than the younger male adolescents. As greater number of older adolescent males took part in the study, their female older adolescents had fewer number participating in the study than their younger female adolescents. The results also imply that the number of younger female adolescents in the Senior High Schools is greater than the number of older female adolescents. This means that a greater number of females enroll in school at an early age disputing the old adage that *'the kitchen belongs to women whiles attending school belong to men'*.

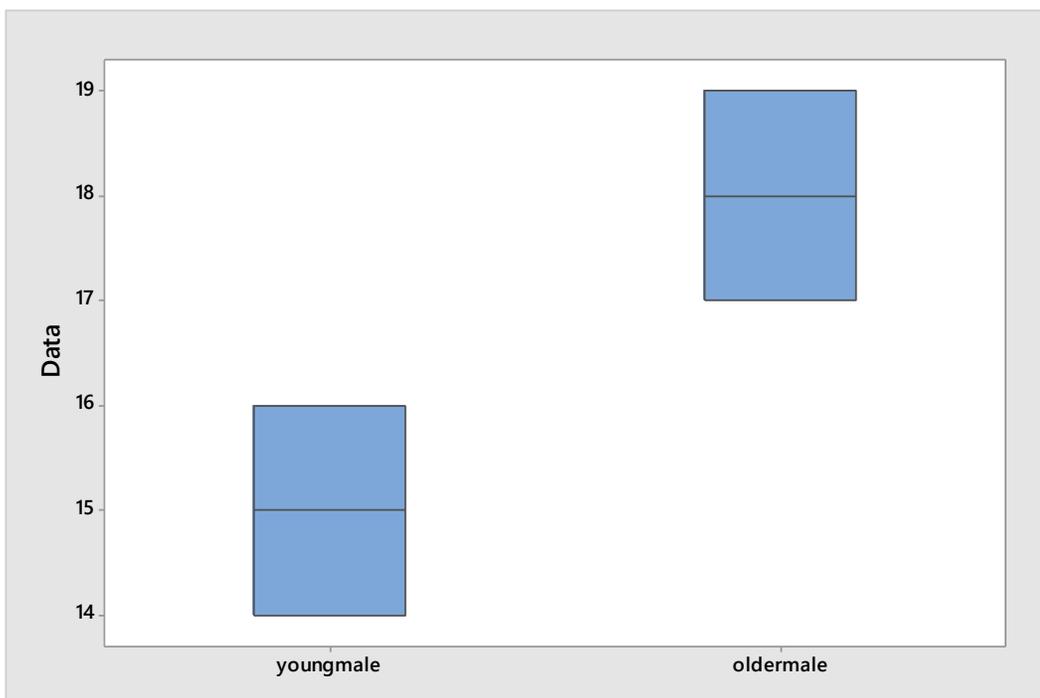
Figure 4: Boxplot for Younger Female and Older Female Adolescents



Source: University Practice Senior High School 2017/2018 academic year records

From Figure 4, the lower quartile age for the young female adolescent was 14 years while the upper quartile was 15.25 years. Again, it could be observed that the median age for the young female adolescent was 15 years. Figure 4 continues to show that the median age for older female adolescent was 18 years while the lower quartile and upper quartile for the older female adolescent was 17 and 19 years respectively.

Figure 5: Boxplot for Younger Male and Older Male Adolescents



Source: University Practice Senior High School 2017/2018 academic year records

From Figure 5, the lower quartile age for the young male adolescents was 14 years while the upper quartile was 16 years. Again, it can be observed that the median age for the young male adolescent was 15 years. Figure 5 shows that the median age for older male adolescent was 18 years while the lower quartile and upper quartile for the older male adolescent was 17 and 19 years respectively.

C. Achievement Motivation among Older and Younger Adolescents

The differences in achievement motivation among the various categories of adolescents was sought in order to realize their significance and the effect of each of the variables (age and gender) on achievement motivation. The findings are shown in Tables 4, 5 and 6.

Table 4: Analysis of Variance for younger male and older male adolescent achievement motivation

	df	Sum of Squares	Mean Square	F	P-Value
Male	1	242.238	242.238	0.647	0.423
Error	101	37809.412	374.351		
Total	102	38051.650			

Source: University Practice Senior High School 2017/2018 academic year records

From Table 4, it can be observed that the p-value (0.423) is greater than the α -value (0.05) hence the findings fail to reject the null hypothesis and conclude that there is no significant difference in the achievement motivation among the younger male adolescents and older male adolescents in the University Practice Senior High School in Cape Coast.

Table 5: Analysis of Variance for younger Female and older Female adolescent achievement motivation

	df	Sum of Squares	Mean Square	F	P-Value
Female	1	333.225	333.225	1.036	0.310
Error	188	60459.428	321.593		
Total	189	60792.653			

Source: University Practice Senior High School 2017/2018 academic year records

From Table 5, it can be observed that the p-value (0.310) is greater than the α -value (0.05) hence the study fails to reject the null hypothesis and conclude that there is no significant difference in the achievement motivation among the younger female adolescents and older female adolescent in the University Practice Senior High School in Cape Coast.

Table 6: Analysis of Variance for gender achievement motivation

	df	Sum of Squares	Mean Square	F	P-Value
Gender	1	70.304	70.304	.207	.649
Error	291	98844.303	339.671		
Total	292	98914.608			

Source: University Practice Senior High School 2017/2018 academic year records

From Table 6, it can likewise be observed that the P value .649 is greater than the α -value 0.05 the study fails to reject the null hypothesis and conclude that there is no significant difference in the Achievement Motivation of males and females in the University Practice Senior High School.

D. Discussion of Results

The aim of the study was twofold. The first was to explore age differences among adolescents in achievement motivation at the University Practice Senior High School (UPSHS) and the second was to examine the variation in terms of gender in adolescents' achievement motivation at the same school. To this end, a survey was conducted based on an achievement motivation instrument

developed by Professor Deo-Mohan (1985). The findings of the study presented in chapter 4 of this study are discussed below within the context of the study hypothesis and reviewed literature.

Ho1. There are no significant differences in the levels of Achievement Motivation between younger male and older male Adolescents in the Senior High School?

No significant differences were found between younger male adolescents and older male adolescents in their achievement motivation at the University Practice Senior High School. The hypothesis that no significant differences exist between younger and older male adolescents was therefore affirmed by this study. This findings is inconsistent with many studies using self-report scales that have reported significant differences between younger and older adolescence in their achievement motivation (Guay, F. Marsh & Bovin 2016, Eccles & Wingfield, 2002, etc.) .The study is also inconsistent with several findings that point to significant differences in achievement motivation between older and younger adolescents. Also worth noting is the fact that the study is not consistent with the developmental theory model presented earlier in this study which basically finds differences in achievement motivation as a person progresses through the lifespan. In sum, the finding is inconsistent with two different sets of findings presented in the literature both of which in different directions suggests significant differences between younger and older adolescents in their achievement motivation. Whilst Guay, Marsh & Boivin (2003) generally find stronger correlation between older adolescents and younger adolescents in their academic self-concept as a facet of achievement motivation, Jacobs, et al (2002); Yeung & McInerney (2005); Salmelo-Aro, et al (2007), find decrease in achievement motivation with increase in age. As stated, this study finds no differences between older male and younger male adolescents in their achievement motivation. The difference may be explained by obvious methodological differences. Guay, et al (2003) uses a cohort study approach. Yeung & McInerney (2005) uses a structural equation model. Crossnoe (2001) uses a longitudinal study model. This study however employs a survey design.

Ho2 There is no significant differences in the levels of Achievement Motivation between younger and older female adolescents?

Similar to the findings in the first hypothesis above, the study found no significant differences between younger and older female adolescents in their achievement motivation. In effect, the study established that irrespective of the stage of adolescents (whether younger or older), female adolescents show similar achievement motivation patterns. The non-existence of differences observed in this study may also be explained by Manheim’s generational Unit model (Edmunds et al. 2002). His approach provides a strong sociological basis for the insignificant differences between younger and older female adolescents in their achievement motivation. According to Manheim, people of the same generation facing the same political, social, historical and religious problems and situations think alike. Female adolescents who were studied fell within the same generational cohort – essentially, they fell within the same decade and therefore according to Manheim, they are expected to go through similar developmental experiences (social, political, economic and religious). Consequently, there is a tendency for these groups to think and behave in similar ways and to have similar interest and values. The groups studied were born into a computer age with abundant access to information; it therefore follows that in most cases they will show similar patterns of achievement motivation.

Also, self-determination theorists provide some useful perspective to explaining the findings of this study. In the view of to Deci and Ryan (1985, 1991), the innate psychological needs of autonomy (the belief that one is the origin and regulator of his or her actions), competence (the belief that one can efficaciously interact with the environment), and relatedness (the seeking and development of secure and connected relationships with others in one’s social context) underpin self-determined motivation. That is, the extent to which the aforementioned needs are fulfilled by what is available from the social environment influences the extent to which the motivation adopted by the individual is considered self-determined. To this end, several different types of self-regulatory styles have been identified (Deci & Ryan, 1985), each having specific consequences for learning, performance, personal experience, and well-being (Deci & Ryan, 1991). A reasonable inference based on this theory will be that similar self-regulation conditions by way of intrinsic and extrinsic motivation exist for both younger and older female adolescents at the University Practice Senior High School (UPSHS).

Ho3 There is no significant difference in the levels of achievement motivation between male and female adolescents

This study also sought to find out the differences between the two Genders in their achievement motivation. It was hypothesized that there is no significant differences between Male and Female adolescents in their achievement motivation. The findings of the study affirmed this hypothesis. No significant differences were found between Male and Female Adolescents in their Achievement Motivation.

This finding is consistent with previous finding (Gokley, Bernard, Cunningham & Motoike, 2004) which found no gender differences between male and female respondents in their achievement motivation. It’s also consistent with the work of Gower, Cole and Philips (1987) whose investigation of gender differences in undergraduate psychology students revealed that the desire to win and the desire to avoid losing existed among respondents irrespective of gender. Gillison et al (2006) also corroborates this finding. His study established that in terms of self-regulation, a facet of extrinsic motivation, both gender show no significant differences. The study is however

inconsistent with findings that suggest that significant gender differences exist between the two genders in view of factors such as gender roles, socialization and relative different goal orientations. (Baswow & Rubin 199, Stinmayr & Spinath, 2009., Green & Debacker, 2004). It must however be explained that most of the studies that have recorded significant differences have been based on research on a specific domain of achievement motivation (Catwright et al, 2013, Giota, 2002, etc.) or in some cases have focused on specific subject areas (Guerin, Fortier & Sweet, 2012) It is therefore not precisely comparable to this study. Also, as indicated in the literature review, much of the contrasting literature have been based on a meta-analysis and on large sample sizes (Duspeyrat, Escribe, Huet & Regner, 2011, Kurma, 2004). In view of the different methodologies, different conclusions are expected. The findings of this study could be explained by various findings in the literature. It suggests that contrary to the views of researchers such as (Eccles, Jacobs, & Harold, 1990; Nagy et al., 2010), who suggest that culturally transmitted gender roles and expectations orient boys to be both more confident and more motivated to succeed, girls are showing achievement motivation similar to their male counterparts and therefore perhaps the traditionally held cultural beliefs about the two genders is changing.

Viewed in the light of the social determination theory, it will be right to observe that optimal conditions exist for both boys and girls to develop in the University Practice Senior High School thus the no differences in their achievement motivation. It is also important to note that it is not known whether the non-existence of significant differences between male and female students reflect developmental trends or are a reflection of educational policy within the secondary schools. For example, with the general deliberate effort by government to mainstream girls education and to promote the education of female children through enhanced enrollment in secondary schools as well as government efforts at promoting girls participation in the Science Technology Engineering and mathematics (STEM) fields, there is no doubt that the right social conditions have been created for girls to aspire to their highest potential. In an era where girls have better access to educational and social opportunities like their male counterparts, it is to be expected that both sexes may show similar motivation patterns.

V. SUMMARY, CONCLUSION AND RECOMMENDATIONS

A. Introduction

This part provides summary of key findings, key conclusions derived from the findings, recommendations arising from the key findings and suggestions for further research.

B. Summary

Stemming from the laudable framework provided by the self-determination theory and the lack of empirical consensus on the literature on age and gender differences in achievement motivation among adolescents, this work sought to investigate whether there are differences in achievement motivation between younger and older adolescents and also whether there are differences between male and female adolescents in achievement motivation. To this end, 293 adolescents were selected by the systematic random sampling technique and were made to respond to questionnaire adapted from the Deo-Mohan Achievement motivation scale (1970).

C. Key Findings

No significant differences were found between older male adolescent and younger male adolescents in their achievement motivation. There was an absence of significant differences between younger female adolescents and older female adolescents in their achievement motivation.

Finally, no differences were found between male and female adolescents in their achievement motivation.

D. Conclusion

The absence of significant differences between younger and older adolescents in their achievement motivation leads to the conclusion that adolescents whether young or old have the same tendency to achieve. It also points to the fact that both age groups are affected in a similar manner by intrinsic and extrinsic motivational factors. Furthermore, considering the absence of significant differences between male and female adolescents in their achievement motivation, it leads to the conclusion that male and female adolescents have similar levels of achievement motivation.

These conclusions have several implications for educators, parents and social workers. In the first place, since the study reveals that males and females show no difference in achievement motivation, it provides fertile grounds for rigorous promotion of fields that are traditionally male dominated such as the Science, Technology, engineering and Mathematics (STEM) fields at the secondary school level among females. School Counselors should make it a deliberate policy to promote these fields among females on the strength of the evidence that male and female students are equally motivated to achieve.

Since there is some evidence that achievement motivation decline as adolescents progress across the lifespan (Dweck & Leggett, 1988), it is suggested that achievement motivation training is taken seriously at post-secondary level through the provision of robust guidance and counseling services so that as adolescents transition into college and graduate school they maintain higher levels of achievement motivation. Contrary to studies that there is a general decline in achievement motivation with age, this study has established that, at least among adolescent groups in the University Practice Senior High School (UPSHS), there is no decline. This study may therefore provide useful basis to cautiously conclude that the decline in achievement motivation over the lifespan does not happen in adolescence.

E. Recommendations

This study has established that there are no significant differences between younger and older adolescents in the University Practice Senior High School in their achievement motivation and also that there are no significant differences between male and female adolescents in their achievement motivation. In view of these conclusions, the following recommendations are hereby made for implementation by policy makers, researchers and teachers:

1. Teachers should make sure that Male and female students should be given equally challenging roles in the school system, particularly leadership. There should be no discrimination based on the assumption that some roles are more male oriented.
2. This finding provides encouragement for policy makers and practitioners who seek to increase enrollment of particularly girls in the STEM fields. It is a good indication that we should pursue a deliberate policy of girls in the STEM fields because when they find themselves in STEM programmes, they will have the same drive to succeed as their male counterparts.
3. With the impressive achievement motivation trend, it means the University Practice Senior High School may have optimal conditions for achievement motivation of both genders. To continue to maintain this trend, it is suggested that the U.P.S.H.S. take achievement motivation training for both genders seriously, so that there is no possible decline for one gender in the future.

F. Suggestions for Further Research

This work examined age and gender differences in achievement motivation across gender and age among adolescents in the University of Cape Coast Practice Senior High School. Results showed that no significant differences exist between male and Female and between Young and Old adolescents in their achievement motivation. The result hold many more prospects for future research among which are as follows:

- a) This study could be extended to look into the specific domains of achievement motivation and whether age and gender differences exist in these domains, in order to support or contest existing literature on differences in achievement motivation between gender and between age groups. It is therefore recommended that further empirical test is done to examine whether age and gender differences exist in the specific domains of achievement motivation among Ghanaian adolescents.
- b) Secondly, the author realizes that, the data presented and the subsequent conclusions drawn were based on only one school located in a semi-urban center. This school is within a university setting which has its own peculiar socio cultural characteristics. Subsequently, an obvious research strategy is to replicate the work in other settings, especially rural settings to make conclusions more valid.
- c) Thirdly because the study examines developmental groups (younger and older adolescents), a longitudinal study in the future may help understand more clearly whether achievement motivation patterns change across the lifespan of adolescents within the Ghanaian context. Also, a longitudinal study will be necessary to develop a better understanding of the relationship between the different aspects of achievement motivation and gender/age overtime. Alternatively, an intervention study will allow an opportunity to examine the extent to which changes in age may produce achievement motivation.

ACKNOWLEDGMENT

I extend appreciation to Eunice N. Amoah and Emmanuel Asare Ayim for their support. I thank you for your timely and constructive comments and suggestions. You have given generously your time and advice in a warm, caring environment that fueled the fire of personal motivation, persistence and resilience to completing this paper.

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A data analysis perspective by the Business Analyst and Data Scientist

Comparative study

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DOI: 10.29322/IJSRP.10.09.2020.p10525
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10525>

Abstract- Nowadays several terms intertwine with each other such as a business analyst and data scientist. Some have dealt with them on the basis that they have the same job, and some have distinguished that the difference between them is significant. This research aims to explore previous studies and scientific articles to compare them. What is the role and responsibilities of each of them and what are the scientific expertise and personal skills required? The researcher found that the business analyst and data scientist both aim to serve their institutions in growth and development in the business sector regarding analyzing data. However, the differences between them exist and should be clear to all interested parties, from data analysts to institutional owners.

Index Terms- data analysis, business analyst, data science, data scientist.

I. INTRODUCTION

Nowadays data flows in huge quantities from various and varied sources, including texts or images or videos. Data flow is becoming a standard solution for managing increasingly complex business processes. Successful business process management has become dependent on modeling and effective data flow analysis (Sun, 2006).

All organizations try to take advantage of the data flow and convert it into valuable information that helps in decision-making, development, and business competition. To this end, organizations use various analytical tools that help to obtain the necessary and useful information from the data collected and analyzed and thus help in a major aspect in decision-making. Good managers can use these tools and data analysis techniques on their own, but as these tools become more and more relevant to technology, some managers need the help of a business analyst to improve the efficiency and competitive advantage of the enterprise (Zdenka 2011).

Hence the need for a job as a business analyst whose duty is to meet the aspirations of institutions and enable them to take advantage of the opportunities available for them. With the development of technology to a large extent, the growing and diversified flowing data in its forms and sources required very advanced techniques to analyze it at an advanced level and benefit from it as well as it required higher scientific experience and personal skills.

The goal has become to not only meet the needs and requirements of institutions and respond to their inquiries but to provide opportunities that even businesspersons did not think.

From this new need, the data scientist emerged and began to discover the best business opportunities through deep analysis and very sharp human intelligence.

In the current research, the researcher explores the role and responsibilities of both the business analyst and the data scientist in analyzing the data. Along with the scientific knowledge and personal skills required for each of them that determine how each of them sees the data. Moreover, what each of them aims when analyzing data?

The research aims to find a unique definition of both the business analyst and the data scientist. To achieve this, the evolution of the role of the business analyst and data scientist and their scientific experience with the personal skills will be addressed to know what each of them capable of offer for their institutions and the business environment. This research may be useful for organizations to know their needs in data analysis and employ the analyst appropriate to their requirements and capabilities.

II. LITERATURE STUDIES

A. Data Analysis

Data plays an important role in the growth of any organization. It is required a lot of analysis and research to understand data in its multiple patterns and including special skills to help understand its directions and infer how it will contribute to business growth. Data analysis can lead to the necessary improvement and changes in organizations' development growth and the capabilities to compete in the business environment.

The traditional data flow may come from basic customer records, historical stock price information, or sales movements. Recently, this flow reaches a huge amount of data flowing from the ever-increasing data in institutions and industries that use and produce big data. Besides data streamed through online channels, for example, Facebook, Google, LinkedIn, or financial trading data (Valchanov,2018).

Charles says in his study (2019) that the analysis refers to dividing data into separate components for examination and audit. Therefore, data analysis is an important process to obtain from primary data useful information for decision-making. Data is collected and analyzed to give answers to questions of enterprise managers and to test hypotheses or verify the possibility. The Xia study (2015) also defined data analysis as the process of examining, purifying, transforming, and modeling data to discover useful information, to reach conclusions, and supporting decision making.

In Vashist's study (2010) the authors said that data analysis contains multiple aspects and approaches, including various techniques under a range of names, and is used in various fields of business, natural sciences, and social sciences. On the other hand, in the past several years, data analysis has rapidly increased in the language of common and current business.

Data analysis in a business environment is defined by Frue (2019) as a research tool for identifying business needs and proposing appropriate solutions to some related problems. The approach varies from improving project management and software to strategic planning. Besides, business analysis can be defined as the set of tasks and techniques used to act as a link between stakeholders to understand the organization's structure, policies, and operations and to propose solutions that allow an organization to achieve its strategic goals.

It should be noted that traditional data analysis, which is mostly done from the analysis of databases in the organization, has produced valuable and important information quantities, but this information over time has become the raw material for advanced analysis processes to know the behavior of the product or customers or other of the organization's interests. More data streams from various sources enabled data analysts to give more raw materials both within and outside the organization's activity to explore broadly the knowledge after collecting and cleaning up this big data using advanced tools in this analysis.

Many researchers have provided definitions of types of data analysis methods, including (Frue, 2019) , (Ajah, 2019)

- Descriptive Analysis: View historical data and describe what happened, and help identify a negative or positive event. Through which the researcher enables logical and realistic analysis of the effect of various variables on a specific phenomenon.
- Diagnostic Analysis: aims to determine the cause of something, can be done to find out the reason behind an event.
- Prescriptive Analysis: collects existing information from other types of data analysis and forms an organization's action plan to address the problem or decision.
- Predictive Analysis: This analysis helps make predictions about trends and behavior patterns. It uses many techniques taken from the data modeling statistics, data mining, artificial intelligence, and machine learning to analyze data in making future predictions.
- Cognitive Analysis: integrates a variety of applications to provide context and answers by collecting data from several different sources and examining in-depth unstructured data, providing decision-makers with a better understanding of their internal processes, customer preferences, and loyalty.
- Augmented Analysis: Provides robotic business intelligence using natural language processing and machine learning. It provides clear results that help in making daily decisions with a high degree of confidence.

B. Data Science

Data science is a combination of skills in three main areas; expertise in mathematics, technology, and strong business acumen (Lo. n.d.). Data science is dominated by overlapping disciplines, which is based on the use of scientific methods, manipulations, algorithms, and systems to extract knowledge and ideas from the data in its two forms, whether structured or not structured. Data science also depends on machine learning techniques, artificial intelligence, and big data processing programs. It is considered a broad field and a mixture of several fields related to each other. It is focusing mainly on knowing and understanding the data that a particular organization has and using it to solve a problem or answer specific questions or provide recommendations derived from exploring the future and tips for management to improve the work or avoid problems, all by following the scientific well-known methodologies.

Sharma (2019) identified the predominantly data science uses for decision-making and predictions using predictive causal and guideline analyzes (predictive as well as decision science) and machine learning when there are no parameters based on which can make predictions, hidden patterns must be found within a set data to make meaningful predictions. The most frequently used algorithm for pattern detection is aggregation.

C. Data Analyst

In this section, previous studies and articles will be studied to know how the systems analyst has been defined, and what his responsibilities are, his/her scientific expertise and personal skills.

The business analyst should have obtained a bachelor's degree in business administration or one of the business analysis programs. Some certifications will be required for professional business analyst such as Certified Business Analysis Professional or Professional in Business Analysis or Certified Analytics Professional.

Business analyst has a good understanding of the technical knowledge whose main focus is to identify opportunities for improving business operations. He/she uses technology to solve problems affecting productivity, distribution, and revenue. Business analysts work requires a high degree of specialized skills to solve business problems through a variety of typical job duties. In other words, the business analyst acts as a link between technology and business. He/she must have a broad understanding of the market and be interested in difficult questions to get value for money and add value to industry innovations.

The business analyst performs business data analytics tasks, regardless of job title or organizational role. The business analyst plays a major role in ensuring that technology is used appropriately to achieve the organization's goals (Richards, 2014). Moreover, the business analyst is somewhat of a vague job title, which can reflect many different roles like data analyst, marketing analyst, operations analyst, financial analyst, etc. He/she is a vital link between information and work. It can be said that a business analyst protects users and IT from each other and plays the role of a mobile bridge for users and ditches for IT staff to enable them to understand each other (Vashist, 2010).

Scientific experiences and personal traits of a business analyst

As the nature of business changes, the role of business analyst is also changed. Now required is to work not only as human reservoirs of the desires and requirements of users but also requires him/her to become inventors and creators and to be facilitators of such innovations to their clients and users. Thus, the shift is simply who applies what leaders want to discover new requirements. This can be accomplished by creative thinking, which is the most important skill of business analysts (Nguyen, 2008).

From a new perspective, creative thinking is a way to look at problems or situations that suggest unconventional solutions. Creative thinking can be encouraged through an informal process such as brainstorming and an organized process such as lateral thought (Shum, 2016). The business analyst is also characterized by logical thinking. This thinking includes high mental processes, in which the person is vital and active, and requires a structured knowledge store integrated into building the cognitive person, along with continuous attention to achieve the goal, and logical thinking begins with sensory experiences and then develops to low-level experiences of abstraction, then to more abstract experiences (Plessis, 2012).

The business analyst must also have good communication skills. This means he/she can facilitate business meetings, ask good questions, listen to answers, and understand what is being said. In today's world, communication does not always happen face to face. The ability to be powerful in a virtual environment via conference calls or web meetings are equally important (Brandenburg, n. d.).

Convincing skill is another skill required by the business analyst. It means the ability that some people enjoy and that enables them to change the behavior, convictions of another person, or group towards another individual, group of individuals, events, or ideas, which are necessary skills for business analysts. Persuasion is often accomplished by conveying a certain message, feelings, information, or reasoning to the other party, or a mixture of it (Nazar, 2013).

According to (EDUCAB, n. d.) there are many tools and techniques for business analysts to use for data analysis process like Blueprint, Axure, Bit Impulse, etc.. That increased productivity and enable them to create very interactive prototypes and business analysts may not need deep technical knowledge they should be confident of a technical point of view in evaluating improvements, designing business cases and defining new standards or modifications to the project.

The most important business analyst tools can be identified as shown in Table 1.

Table 1: business analyst tools

	Tool	Benefits
1	Business Process Model and Notation (BPMN)	BPMN is a graphical representation that allows the business analyst to specify business processes in a business process model.
2	Business Process Execution Language (BPEL)	BPEL is a prominent form of contracting agreement in the construction industry.

3	Service-Oriented Architecture (SOA)	SOA is an XML-based language that allows web services in a service-oriented architecture (SOA) to interconnect and share data.
4	Blueprint	Blueprint is essentially a collection of services. The communication can involve either simple data passing or it could involve two or more services coordinating some activity
5	Axure	Axure is a reproduction of a technical drawing, allows the business analyst to documenting an architecture or an engineering design, using a contact print process on light-sensitive sheets.
6	Bit Impulse	Bit Impulse is a kind of design tool that enables the business analyst to construct a visual, interactive display of concept concepts that can be conveyed to the customer / leader or to a development team.
7	Online Analytical Processing (OLAP)	OLAP is a business analytics tool made by BIT Impulse. It gives the business analyst the great possibilities of data analytics in the application. It has advanced ways of OLAP data visualization.

Business analyst responsibilities

The business analyst deals with work problems and performs daily valuations. He/she provides answers to a specific set of business questions asked. The business analyst is responsible for creating new models that support business decisions by working closely with the financial reporting and information technology departments to develop programs and strategies to increase imports and manage costs. Requires a solid understanding of organizational requirements and reporting, as well as a lot of experience associated with forecasting and financial analysis.

From the study (Sonteya, 2012) the responsibilities of the business analyst can be defined as follows:

- Show information about the organization's mission, vision, and goals.
- Provide insight into how the organization's approach is aligned with its priorities and then with operations.
- Awareness and ability to use process-modeling tools, such as BPMN, BPEL, OLAP, etc.
- Experience in personal relations and cooperation.
- Demonstrate practical knowledge of auditing.
- Carry out the ongoing research of market climate change to assist in the transformation process.
- Demonstrate awareness of change management.
- Discover the process's inability and work to find a solution.
- Take advantage of modeling techniques to achieve potential outcomes.
- Explain information about SOA and BPEL related programs
- Discover relevant SOA programs for use in applications.
- Demonstrate a strong understanding of the service infrastructure.

Sonteya's article (2012) indicates job description for a business analyst, according to Robert Half Technology which includes:

- Create a detailed business analysis, and identify problems, opportunities, and solutions for business.
- Budgeting and forecasting.
- Planning and monitoring.
- Analysis of variance.
- Reports preparation.
- Identify business requirements and communicate them to stakeholders.

In Chatterjee study (Chatterjee, 2019) she lists the following responsibilities:

- Engage with existing and potential clients and assist them in approving products and solutions to meet their business requirements.
- Ensuring consistent growth in product awareness, adoption and use by customers.
- Highlight product concepts and solutions through presentations, demos, user preaching, and effective documentation.
- Leading discovery sessions with information technology and business leaders to understand the client's business goals and needs.
- With an excellent understanding of product features and related technologies, the solution is designed to best meet customer requirements.
- Proactively create documentary files like business cases, usage scenarios, solution diagrams, common questions, meeting notes, etc.

- Leading other client success teams to ensure the successful completion of the project milestones for production and the initial stage of the project.
- Communication, progress, expectations, and escalation of awareness and solution problems.
- Training and customer support and promoting the adoption and use of solutions.
- Provide regular and adequate user comments and feedback to the product team.

D. Data Scientist

It has already been said above that the need for more accurate and deep analyzes and the need to explore the future and raise the rate of achieving future expectations led to the emergence of the term "data scientist".

A data scientist is someone who has the task of working with a lot of data to extract useful insights either to fix business problems or reveal hidden trends and patterns that can be used to achieve business goals. He can predict the future using trends from the past, present, and, expected future (Villanova, 2018).

The data scientist has a bachelor's degree in the data science program. Some certifications will be required for professional data scientist professionals such as a professional certificate in Data Sciences.

The data scientist revolves around a new technical discovery that can solve complex problems and extract facts using accurate statistics (EDUCAB, n. d.). He/she knows how to extract meaning and interpretation from data, using both statistics and machine learning methods and methods. The data scientist spends a lot of time collecting and cleaning data because the data is usually never clean.

This process requires perseverance, familiarity with the world of statistics and software engineering skills, and is necessary to understand biases in data and to correct login outputs of code. Once the data scientist converts data into a form, the crucial part is exploratory data analytics, which combines visualization with a sense of data. Moreover, the data scientist has a unique knowledge of mathematics, technology, and business acumen skills. Data scientists work to extract ideas and develop information products at the primary database level. A common personality characteristic of data scientists is that they are deep thinkers with intense intellectual curiosity (Lo, n. d.).

Scientific experiences and personal traits of the data scientist

Babu (2019) determined that data scientist needs to learn the latest software and advanced knowledge of machine learning and may need programming and should have detailed knowledge of mathematics and statistics. He/she must understand big data, store data, visualize data as well as machine learning (EDUCAB, n. d.). The data scientist must be expert in one or more of the most important programming languages including Python, R, Java, SQL, and Julia

The data scientist is characterized by intelligence, great scientific curiosity, and the ability to use the latest tools of scientific analysis to explore the flow of data. He/she tries to find new surprising innovative opportunities for employers that may achieve great strides in the field of competition in the labor market. Indeed, intellectual curiosity appears to be a vital feature of the data world. Stumm (2011) has defined scientific curiosity as the desire to recognize and appreciate more individuals, cultures, ideas, and concepts. Besides, this interest also stimulates investment of time and energy in the pursuit of knowledge.

Table No. 2 represents the most important scientific expertise that must be possessed by the data scientist as identified by the studies mentioned above.

Table 2: data scientist tools

	Tools	Benefits
1	Machine learning	Machine learning is the scientific study of algorithms and statistical models. The data scientist uses it to let computer systems to perform a specific task without using explicit instructions, relying on patterns and inference instead.
2	Artificial intelligence	Artificial intelligence is the intelligence possessed by machines ,which helps tremendously in analyzing data in a very fast and accurate way.
3	Data wrangling (data munging)	Data wrangling allows the data scientist transforming and mapping data from one "raw" data form into another format to make it more appropriate and valuable for analytics.
4	Big Data	Big Data helps the data scientist to treats and analyze, systematically extract information from, and deal with data sets that are too large or complex to be dealt with by traditional data-processing application software.
5	Data warehousing	Data warehousing is typically used to connect and analyze business data from heterogeneous sources. It helps the data scientist to make use of technologies and components which help the strategic use of data.
6	Data visualization	It is a graphical representation of information and data. It helps the data scientist to use visual elements like charts, graphs, and maps, data visualization tools to provide an accessible way to see and understand trends, outliers, and patterns in data.
7	Programing languages	Python, R, Java, SQL, MATLAB

Responsibilities of the data scientist

The responsibilities of the data scientist as defined by Bandyopadhyay (2017):are as follows

- Framing the problem: by asking questions like who is the customer? How exactly does the customer ask the data scientist to solve his/her request? How can their vague request translate into a specific and concrete problem?
- Collection of primary data needed to solve the problem: Is this data still available? What pieces of data would be useful if so? Otherwise, what data do data scientists need? What kind of tools will you need to collect this data in a usable form?
- Data processing (data sparring): Real raw data is rarely used. Inaccurate data collection errors lost values , and many other problems the data scientist will have to deal with. The data scientist will first need to clean the data to convert it into a model for further analysis.
- Data exploration: What kinds of trends or clear correlations do data scientists see in the data? What are the high-level properties, and which of them is more important than others?
- Conducting in-depth analysis (machine learning, statistical models, and algorithms): this stage is where all advanced data analysis equipment is applied to monitoring high-value observations and forecasts.
- Communicate the results of the analysis: All analyzes of the data science and scientific results are of little use unless he/she can clarify what they mean to stakeholders clearly and convincingly. Data narration is vital and important.

In addition, O’Neil (2013) listed the following responsibilities of the data scientist:

- Identify data analytics problems that provide the greatest opportunities for the organization.
- Define correct data sets and variables.
- Collecting large groups of structured and unstructured data from various sources.
- Clean and validate data to ensure accuracy, completeness, and standardization.
- Develop and implement models and algorithms to extract large data stores.
- Analyze data to determine patterns and trends.
- Interpreting data to discover solutions and opportunities.
- Communicate results to stakeholders using visualization and other means.

From Chatterjee ’s study (2019) he explained several responsibilities to the data scientist, including:

- Demonstrate and lead deep technical expertise in solving business problems in the real world by applying machine learning.

- Collaborate with other team members inside and outside the data science team to create and deliver world-class data science products.
- Prepare monthly plans and prioritize requests from partner product teams.
- Partnering with the product team to create key performance indicators (KPIs) and new measurement methodologies.
- Translate data into actionable insights for stakeholders.
- Automate reporting for weekly business metrics, and define areas of opportunity to automate and expand custom analyzes.

III. RESEARCH METHODOLGH

The current research aims to find the distinguished definition by finding out the difference and similarities between business analysts and data scientists concerning their scientific expertise, personal skills, and responsibilities. To achieve this goal, the comparison method is used because it is best suited for research purposes. The comparison method relies on monitoring and extrapolating the published and related intellectual production. It is the work of comparing two or more things to discover something about one or all of the many things that are compared (Jochen, 2004). The researcher searches in literary studies to find the definitions, scientific experiences, responsibilities, and personal skills required for both the business analyst and the data scientist to find a unique definition for them. It was found that most of the research and articles that were studied in this research were based on specific criteria for comparison. Common standards between them can be determined as follows: scientific experience, personal skills, and responsibilities.

Previous studies and scientific articles have studied these differences and identified them in general, however current research seeks to find the distinct differences between the business analyst and the data scientist to come up with a definition that distinguishes them from each other.

IV. DISCUSSION AND ANALYSIS

Table No. 3 Shows the most distinguishing differences between the business analyst and the data scientist as well as the similarities. The most important resemblance between them lies in the goal or purpose of their work as both the business analyst and the data scientist aim to support and assist corporate leaders in making appropriate decisions regarding development and competition.

The business analyst begins the analytics process from the reality of the questions or requests that are asked and tries to link the leaders of the enterprise and technology to enable them to understand what technology can offer to them in addressing business problems and support the development of the organization.

While the data scientist begins to analyze data from the reality of the desire to explore the new and try to get opportunities for the organization that has not been fully seen or imagined yet. The data scientist develops his/her questions and tries to answer them through careful analyzes, patience, and scientific curiosity, and thus aims to discover unexpected opportunities.

A business analyst can study and analyze past and present data and find, for example, the movement of a particular product for the organization during a future period. On the other hand, data scientist, by using big data and deep analyzes, he/she can reach the movement of a specific product that has not been put on the market yet.

Both of them are characterized by good communication skills, the ability to solve problems, creative and critical thinking. Moreover, the ability to persuade business owners of the solutions or proposals that reach them. This enables them to solve the organization's problems and meet its requirements. In addition, the data scientist besides, characterized by acute intelligence and great scientific curiosity.

Both of them have good experience in mathematics, statistics, technology, business, and software engineering skills. The business analyst is considered an SQL expert. On the other side, the data scientist characterized by a deep understanding of machine learning.

Table 3: Comparison between Business Analyst and Data Scientist

Factors	Business Analyst (BA)	Data Scientist (DS)
The main responsibility	Corporation service	Corporation service
The additional responsibilities	Acts as a link between technology and business leaders. BA deals with work problems and answers specific business questions.	Predict the future using trends from the past. DS deals with business problems and answers the ungiven questions.
Personal attributes	Driven by creative thinking.	Driven by intellectual curiosity
Soft skills	Communication skills, persuasion, and problem-solving skills.	Communication skills, persuasion, and problem-solving skills.
Scientific experiences	Experiences in mathematics, statistics ,technology ,business , and software engineering skills. Spreadsheet Tools - Data Visualization- Blueprint- Axure -Bit Impulse-Business intelligence- BPMN- BPEL-SOA.	Deep experience in mathematics, statistics, technology ,business acumen, and software engineering skills. Machine Learning-data warehousing-Data visualization- Hadoop
Programming languages	Python – R – SQL – HTML – JavaScript	Python – R – SQL - Scala
The purpose of the data analysis	To address the problems of the organization.	To discover unexpected opportunities for business growth in the organization.
The focus during the analyzing	Data with trends in the past - present.	Data with trends in the past - present -predicting the future.

Since this comparison is between human beings, there is no way for decisively separating responsibilities, scientific expertise, or personal characteristics. We cannot prevent the business analyst from developing him/herself and going beyond his/her previously defined role and providing brilliant proposals, and at the same time, we cannot expect everyone who graduates from data science programs to gain the data scientist's high capabilities from the first steps.

The data scientist gains the high capabilities by the continuing working and analyzing data and gets a deep experience by using scientific curiosity and gain the accumulated experiences and achievements and provide valuable opportunities for business that constitute a milestone in the development of the organization and can be added to his/her record.

The word "scientist" is a valuable word and it is given to the one who has given him/herself to science and delved into scientific knowledge in a specific field, meaning that knowledge in his/her specialization outweighs the habit. This can not be gained only after working hard and digging deeper into the field for years and making many achievements and building a broad experience that is the outcome of permanent work along with the sharp intelligence and scientific curiosity.

To redefine both the business analyst and the data scientist according to what has been addressed, it could be said that:

- **Business analyst:** A person who graduated from one of the business analysis programs, with scientific experience in data analysis and in particular data modeling applications. He/she also has communication skills, persuasion, and creative thinking. Business analyst aims to solve business problems and provide appropriate suggestions to meet the requirements of enterprise leaders to develop business. He/she is the link between technology and business leaders to enable them to understand the benefits of technology and benefit from it. He analyses data from past and present trends.
- **Data scientist:** A person who graduated from a data science program with scientific experience in data analysis, especially in machine learning. He/she has communication and persuasion skills and is characterized by logical thinking, scientific curiosity, and a high ability to analyze data patiently and carefully. He/she aims to provide unexpected opportunities for the organization's leaders to enable them to compete and rise to the top. Data scientist analyzes data from past and present trends, discovering and predicting future opportunities. He/she is characterized by a large sum of achievements, exploration of opportunities, and unexpected solutions.

Thus, the two previous definitions clearly distinguished the data scientist by having accumulated experience of unforeseen achievements and hidden opportunities discovered in the interest of the distinctive development and progress of the organization. To sum up, the business analyst sees the data analysis from the perspective trends in the past and present to support the organization's plans and answer the business questions, on the other hand, the data scientist sees the data analysis from the perspective trends in the past and present and future to discover unexpected opportunities for business growth.

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Informalisation Of Economy And Its Impacts On Women's Labour In India

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DOI: 10.29322/IJSRP.10.09.2020.p10526

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10526>

Abstract: This paper aims to map the growing informalisation of economy, and its impact on providing meaningful employment to women in India. Over the years, informality of labour has gained prominence as a source of employment and a means of survival for vulnerable sections of the society, with women leading in numbers. Locating the underlying causes for the expansion of informal economy, in globalisation and trade liberalisation, the paper deals with the threats and dangers of such an economy for women, which broadly include lack of social security and protection, and political and economic instability, while placing all their concerns in the geographical and social context of India. Lastly, an endeavour is made to change the narrative for formalizing women's labour and adjusting socio-economic disparities through the role of state and community action, by employing different techniques for redistribution of resources, and recognizing and representing women's labour and voices.

Index Terms: Informal sector; Informal workers; Women in the informal sector and social security; Indian Economy

INTRODUCTION

The conscious use of the phrase 'informalisation of economy', in place of informal sector, is required here to understand the various manners in which labour can be informalised across the binaries of organised/unorganised sector—implying that informality in an economy does not need to assume a particular mode or location of labour use, as indicated by conventional definitions. As Harding and Jenkins argue that every social action, regardless of whether it is economic, political, or any other kind of social action, possesses elements of both formality and informality, 'informalisation of economy' offers a progressively comprehensive standard and inclusive criteria for evaluating informal work which, being heterogeneous in nature, could exist and overlap with the formal sector as well. It is closer to the definition that National Commission for Enterprises in the Unorganised Sector provides—

"Informal workers consist of those working in the informal sector or households, excluding regular workers with social security benefits provided by the employers and the workers in the formal sector without any employment and social security benefits provided by the employer."

This definition is more apt for identifying the inequalities created through the intersection of gender, globalisation, informality, poverty, within the political and social geography of India, to envisage better policies for providing decent work.

Despite much discourse around the ills of informality of work in India, it remains as relevant and complicated an issue in the present, as more than 90% of India's workforce continues to be engaged in the informal economy, according to the The Economic Survey of 2018-19. An estimate of about 415 million workers are informally employed, with a vast majority of it being constituted by rural-to-urban migrants, and contribute to a close figure of 50 percent to the national income (NSSO, Government of India, 2011). In spite of its contribution to the factors of production, the informal economy, operating outside the jurisdiction of corporate law, poses prominent problems of job security, social security, stability of living, migration, child labour, and exploitation of working women (Bertulfo). Given the easy access to the sector and quest for availability of vocation openings, mainly low-income groups are engaged in informal work, due to which it has gradually become synonymous with parallel markets, connoting a blend of poorly skilled, low-paid and flash food workers; or as indicating a sort of marginal, 'separate' economy, born out the survival strategies of marginal social groups. With the social stratifications in India on the basis of class, caste, and gender/sex, it so becomes the case that a high

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10526>

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proportion of the marginalised sections occupy the pie of informal economy (NSSO, Government of India, 2004). While this makes employment highly unstable and incomes low and irregular, the public policies towards the informal workers oscillate between negligence of their health, lack of social care, and/or violence and harassment.

Impact of Liberalisation, Globalisation and Privatisation (LPG Strategy)

While informalisation of economy has been on the ascent in India since 1980s, the trade liberalisation, globalisation and privatisation strategies which were adopted during the 1990's in response to the country's economic crisis, acted as a catalyst for unorganised labour to multiply and consolidate. Over 22 years of post-liberalisation, 92% of the jobs created are informal in nature (NSSO, Government of India, 2011). Initially what was seen as a temporary phenomenon, understood largely as a by-product of a stagnant economy, informal employment was expected to disappear over the years (Harris, Todaro; Lewis). However, the contrary has been recorded with its exponential growth. While many argue that trade liberalisation aims to promote an economy's exports, thereby creating employment opportunities for growth, in India, free market competition, changed market boundaries, and modern capital-intensive technology has led to a wide scale employment loss in the formal sector, forcing retrenched workers to enter informal markets due to their ease of access and entry. Moreover, global trade and expansion in the volume and variety of cross-border transactions in goods and services, foreign direct investment, increase in international capital flows, and labour migration patterns, tend to privilege companies which are cosmopolitan in their functioning and disadvantage labour, as investors find it beneficial to shift to countries that provide high-output and low labour costs—a combination most easily available within an informal employment arrangement. In the entire movement, women tend to suffer the most as they are pushed to the lowest-income end of the informal economy, which generally includes piece-rate work, self-employment, paid work in informal enterprises, disguised unemployment, casual work, home-based work, and street vending, where the last two are the largest contributors for providing employment to women in India.

Placing Women's Labour in the Informal Economy

Before acknowledging the role, contribution and problems of the informalisation of women's labour, it is to be noted that the category of "women" has to be treated as a heterogeneous group, as many of the women engaged in this economy are located at the intersections of different kinds of inequality: class, race, caste, occupation, and legal status. Thus, not all women are equally prone to, and face similar dangers of the informal economy which include low employment status, sporadic or no compensation, or no remuneration, negligible access to social security, and casual conditions of part-time, irregular, and often home-based activities—marked by geographical dispersion and social isolation. Therefore, "gender" needs to be treated as a relational concept, in conjunction with the intersectionality principle, for acknowledging the plurality of social identities and the manner in which these differences overlap and manifest into the economy (ILO 2017:45).

Socio-Economic Subordination

The phenomenon of informality being higher amongst women is a direct consequence of their social perception in the society which ascribes a subordinate role to women both in domestic and public spheres. It is ironic that despite women occupying a higher proportion in the informal economy, they are the least visible workforce, with their contribution being unaccounted for in the national product (Carr, Chen). With the regional differences that arise in the manifestations of informal economy, it becomes difficult to assess the exact number of women workers, who fit into the informal category. Consequently, they are afforded jobs that lack any future promises of betterment, or increase in efficiency and training, restraining them from being able to find stable jobs later (Fapohunda). Since they occupy positions which are at extremely low levels of organisation and scale, they heavily depend on daily profits for survival as they lack access to institutional credit (Schneider, Bajada). The gender gap in income also appears to be noticeable in the informal sector, and the overlap between working in the informal economy and being poor hits women harder. Poor women, and especially home-based workers, domestic workers, agricultural workers, migrant workers, sex workers and those working in other hazardous jobs are exposed to the perils of gender-based violence, in the form of periodic harassment by local authorities, since they lack a formal setting for their operations; for which, they have little to no power in taking recourse to institutional retributions or legal assistance (ILO 2016).

Non-Division of Market and Domestic Activities

Women are accorded the status of “secondary workers”, as it is often that case that their work is not considered to be a separate legal entity, divorced and independent from the household (Bhatt 72). It has likewise been noticed that the internalisation of the broad social perceptions of their work as lacking value, makes it alien for women workers to consider themselves as workers. Women may see their work as an extension of their unpaid care work, arising from their roles as mothers, wives, and members of their community, which simply devalues their work by obscuring any distinctions between their market and domestic activities within the socio-economic structure of informality, and often refrains them from collectively organising around stable and remunerated activities (Bruschini, Lombarda 135–192). The binary of assigning reproductive work to women, and productive to men is reinforced, as a result of which, women’s scope for undertaking new activities are restricted by traditional roles of domestic labour, inadequate infrastructure, time and space constraints, and care burdens (Palmer 1981-1986; ILO, 2013b). Gender barriers—which accord a secondary role to women’s labour—in terms of access to credit, technology, business services, training, welfare, insurance, and the market, often produce the “discouraged worker’s effect”, due to which many women end up dropping out of the labour force altogether (Chant, Craske).

Rural-Urban Divide

In the Indian context, the rural-urban divide becomes an important vestige of analysis of informality. While agricultural workers form the bulk of the unorganised sector in the rural areas, urban spaces harbour contract and subcontract as well as migratory agricultural labourers. The working poor are concentrated in the informal economy, especially in the rural areas. Moreover, since the positive relation between working in the informal economy and being poor is stronger for women than for men, women from low-income segments, mostly the rural-poor, end up working as casual wage workers, home workers, or disguised workers in the agricultural sector, in which 97 per cent of the employment generated is informal in nature. Despite the agriculture sector employing 55% of the nation’s labour force in 2017, its contribution is estimated at a meagre 16% to the GDP, and speaks of the invisibilisation of women’s contribution to economic activities, as women are most likely to work as disguised labour. On the other hand, the higher income segments, mostly constituted by the urban women workforce, tend to be engaged in small-scale operations, and are mostly employed as domestic workers, home-based workers, street vendors and waste pickers. While gendered violence in domestic and work spheres affects all women in the economy, poor and rural women often have lesser resources to seek legal protection than middle class and urban women.

Different Kinds of Work(ers)

Roughly about 20 million people, mostly women, migrate for domestic work to Mumbai, Delhi and other metropolitan urban areas from the eastern states of Bihar, Orissa, Chhattisgarh, Jharkhand, Assam and Mizoram. Domestic work is infamously characterised by long working hours, low wages, negligible negotiation with the employer, and those engaged in it are more vulnerable than other kinds of workers, because they are not officially classified as workers at all, lacking any immunity of laws that apply to workers otherwise (Neetha 1681-1688). Home based workers too, are not recognised as an independent category of workers by the Census of India, and are estimated to be a part of household industries, due to which there is a general trend of underreporting women’s participation, and under-evaluation of their work as productive or economic in nature (Henriquez, Perez 5-23). In undertaking home-based activities or domestic work, mostly working on piece rates, women endure the consequences of not only being invisible physically in the workspace, but also become socially isolated from other workers engaged in similar occupations. As a consequence, they are unable to organise themselves in a network, leading to further ostracisation from statistics on informal labour and policy-making procedures. In the case of construction labourers, the poorer and marginalised castes, indigenous communities and migrants, tend to dominate the pool of workers, where women bear the brunt of remaining in low-paid unskilled jobs. Women who are self-employed form a heterogeneous group of workers, and suffer lower quality of self-employment opportunities, where gender gap is most visibly reflected in lower pay and occupational distribution, conjoined with the constraints on access to credit. In India, the process of taking loans in their own names is cumbersome, as administrative requirements are especially restrictive due to the absence of independent taxation and legal status, and are generally recipients of smaller loans than men (Lycette, White 122).

Formalising Women’s Labour

Women still continue to work in the informal economy for multiple reasons. One of them being that many women typically lack higher education or adequate skills, and therefore, cannot engage in wage employment in the formal economy. The lack of mobility and social acceptance of women working outside homes is still uncommon; as a result, they are confined to work at home, and exercise little choice or control in the type of work they wish to undertake. Furthermore, many women opt for informal work as a means of survival, and to contribute to household income, which makes them vulnerable to accept any kind of work available. Therefore, to formalise the labour of women, a combination of state-level action and changing the narrative around informalisation through the use of soft power, in forms of cultural symbols, discourses around their identities, and dissemination of information regarding their status and rights, can escalate the scope for policy action to correct inequalities. Rather than a surface-level corrective action, a more fundamental reform is needed where the first and foremost question is about exploring the gendered dimensions of national/local, economic, political and social, processes and institutions, and social protection (Abramo, Valenzuela), so that the traditional roles assigned to men and women in employment are revisited, as it is often the case that systems responsible for protecting women workers are themselves ridden with these biases. The various initiatives that can be undertaken towards formalisation can be broadly classified under three categories, given their nature and scope i.e. recognition, representation, and redistribution.

Recognition

The politics of recognition aims to address issues that are broader in their scope of demanding change, changes other than what trade unions have conventionally addressed. For the most marginalised women (waste pickers, domestic workers, sex workers, migrants), the concern is as much about dignity and recognition, as the exigencies of survival. Waste pickers and sex workers are devalued due to the pervasive stigma around their occupations, and therefore, their rights as humans need to be simultaneously emphasised with their rights as workers. Domestic workers, on the other hand, face social exclusion in terms of no value being attached to their work. Home-based and self-employed workers need better access to financial markets, and enhanced capacity to overcome being excluded from the market. Migrants are exploited due to their perception as having an ‘alien’ status, as being an outsider to the people of the land, and therefore, the first form of protection they need is to be recognised as citizens, as essential and contributing members of the society, and reduce the hostility of the public towards migrants.

The process of building social and self-recognition of the value of the work that women in the informal economy do, is slow paced and requires continuous effort to collectivise women who are otherwise divided by their social location/s. While informalisation manifests in various ways, at the national and global level, depending on the dynamics of politics and economy at both levels; focusing on local movements, oriented towards communities and individual, that aim to change patriarchal mindsets, and help women develop a sense of self-worth, is an essential programmatic approach as it provides relevance to workers’ concerns in the context of their everyday lives. Instead of targeting the government or policymakers, this move emphasises on locality of action by accepting the failure of public advocacy in not being able to change the way people act within their homes, neighbourhood communities, and immediate spaces. While the role of external agencies, such as the government, donor agency, trade union, or NGOs cannot be denied, the changes in the fabric of thoughts of families, neighbourhoods, and communities, on caste/class/gender networks, offer a different kind of social security—by curbing exclusion and exploitation within these community spaces.

Representation

The representation of women workers in the informal economy encompasses two aspects—providing a voice to women to express their concerns and propose possible interventions which will have a geographical and social focus, and visibilise the work that otherwise remains unaccounted for in the national product. It is imperative to do so as the strategies that will work most efficiently are the ones that are contextually developed, where the context is not assumed but built. It is the locally grounded practices of organisations in representing lived experiences and realities of women workers, that will help in informing the strategies and plans adopted at national and global levels. It is only then that the policies can validate their claims of representation, as they will be conscious of the geographical differences in India, and how they interact with structures of gender and inequalities.

In India, the government needs to cooperate with civil society organisations working on-ground with informal workers to formulate plans and policies, to ensure that there is an amalgamation of top-down and bottom-up approach for meeting the specific requirements of the workers. Such an approach is beneficial in avoiding any assumptions about the social realities of the women workers, and ensuring that the voices of stakeholders are not taken over by the few privileged of the formal sector. These

organisations working on a community level, are capable of employing a different strategy from the ones adopted by trade unions. Being more local in nature, they work to organise women into formal groups, by first changing their social position. Given the hierarchy in social identities of the workers, women might at first, feel alienated from the process of building a shared and valued identity with other women, for advancing their rights as workers. Therefore, it becomes essential for these organisations to strategically organise them around issues that are points of commonality, other than being informal labourers; for example, the gendered violence they are exposed to as women, or the concerns of child-care and drinking water as rural women might offer a point of mutuality.

Redistribution

While informal labourers are usually paid daily wages, with rates ranging from Rs.400 to Rs.1000 (US\$5 to US\$13), the scope for savings disappears; in fact, many informal employees do not even own bank accounts for their earnings. Therefore, redistribution is an essential move towards formalisation, and is concerned with fostering changes in wages, working conditions, and social security of the labour, and increasing women's access to credit, welfare funds, and insurance. The ultimate aim is a holistic human resource development policy that improves women's employability through training, legislation and effective enforcement of legal safeguards. Witnessing the failures of formal training systems in being unable to reach out to and assist informal economy workers, especially vulnerable sections such as poor women, and studies suggesting that labour reforms alone, such as the introduction of the Unorganised Workers' Social Security Act, 2008 and The Code on Social Security, 2019, will not be able to reduce informalisation of the economy, a reconceptualised method of redistribution becomes an urgent demand. In this regard, there is a need to advance micro-financing schemes to open up possibilities of entrepreneurship for women in the economy, so that they are encouraged to register micro and small enterprises. It will further help in ensuring better access to finance, better infrastructure, market information, government incentives, and provide a platform for formal association and a legal framework for their operations to guarantee regular returns. Micro-financing through Self Help Groups (SHGs) is an additional effective mechanism for providing financial services to those sections which are the hardest to reach, and also improves their socioeconomic status of women workers by reducing the inequalities borne out of the relationality between gender and class, and by strengthening their collective self help capacities—leading to their wholesome empowerment (Kabeer et al. 253).

Information and training of the workforce regarding their legal rights as women, as workers, and as citizens, need to be disseminated, to counter the effects of lower levels of education, and increase their power to negotiate with the employer for decent work, wages, social security and job security. To extend the outreach of social security benefits, publicly-managed schemes and anti-poverty programmes focusing on providing community-based health financing schemes and extending maternity protection for women in the informal economy, can assist in accounting for the gendered nature of the care economy (Budlender; ILO, 2003a). Parallel to the process of disseminating knowledge of the law to the workers, the procedure of building up of citizenship as well as worker identities, and engaging them in political and policy processes in diverse ways, can help in dealing with inequalities that arise out of the divisions of caste, race, gender, and legality, and to counter the political economy of exclusion, born out of the processes of informalisation, from the interdependent relationships of exploitation, marginalisation, and exclusion (Schierup et al.).

CONCLUSION

The conundrums posed by informalisation are multi-faceted, especially with regards to the concept of 'gender', as a substantial part of women's work in India is characterised by lower remuneration, higher health hazards, and substandard working conditions, as compared to that of men—leading to their social and economic exploitation. As has been noted, the move towards creating a formal market environment cannot wholly be addressed by labour reforms alone. Therefore, policies and community action aimed towards educating and skilling the labour force are vital for providing employment security and social security benefits, as are changing the societal values and position of women. The movement towards formalisation can be brought about by recognition and representation of women's participation in the workforce and their community as workers in the process of policy-making, and redistribution of resources, to address and minimise gender-based disparities in economic activities and enhancing the socio-economic positioning of women in the economy and society.

ACKNOWLEDGEMENT

I would like to thank my professors at the University for guiding me through my research paper.

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MSME Competitiveness Analysis of economy in transition from Factor Driven to Investment Driven Stage: Case study of Andhra Pradesh

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DOI: 10.29322/IJSRP.10.09.2020.p10527

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10527>

Abstract

The purpose of this paper is to identify the growth areas in manufacturing sector which can provide impetus to a factor driven economy to scale up and reach investment driven stage. It assesses the competitiveness of four manufacturing sub-sectors of an emerging sub-national economy through Porter diamond analysis. We explore the relationships between various components of Porter's diamond for select manufacturing sub-sectors in the State. While the key findings of the analysis include a distinction between the competitiveness drivers for low skill labor intensive sectors and capital intensive manufacturing sectors. The main findings include the identification of competitiveness drivers for the manufacturing sub-sectors and role of the state government in giving them an accelerated push.

Keywords: Competitiveness, Emerging Economy, MSMEs, Porter Diamond Analysis, Structural Transformation

I. INTRODUCTION

Exploring the prospect of economic growth for developing countries, significant research has been conducted by economists in suggesting alternative development models (Solow, 1956) (Gustav, 2004). (Rodrik, McMillan, & Sepulveda, 2016) have asserted on the structural transformation of an economy for increasing its productivity levels. This essentially means shifting of the resources into those economic activities that ensure higher value addition and hence productivity. As industrial productivity is highly correlated with competitiveness (Backus, 2019), structural transformation becomes an imperative action for the least developed and developing countries. The pattern of structural change undergone by an economy may however vary, like the case of African economies that have showcased a decline in the labor productivity growth from the modern sectors of the economy as an outcome of increased incomes from agriculture (Diao, Rodrik, & Margaret, 2017).

(Joshi & Somayaji, 2019) have asserted that economies have raised their competitiveness as a function of different development pathways followed. While some economies chose to increase their competitiveness by marking a linear shift through strengthening the factor driven parameters like infrastructure, education, and technology; few economies chose to build upon their industrial productivity by strengthening the goods market efficiency and institutional indicators. While industrial applications of technology play a critical role in transforming an economy from factor driven to investment/efficiency driven, nations that are at a mature stage of factor-based comparative advantage can accelerate their low/semi-skill labor intensive industrial base by adopting the export-oriented production (Kitson, Martin, & Tyler, 2004). In the context of developing economies it has been observed that although their small & medium manufacturing units do not have a significant representation in the global value chains, few clusters have become evolved into being export-oriented (Tambunan, 2009). In this case competitiveness of these units has been a function of various levers like level of innovation and business strategy (Anton Agus, Muzakan, Muhammad, Syamsuddin, & Sidiq, 2015). Among the other critical levers of increasing competitiveness were development into a cluster agglomeration in order to achieve the optimum resource sharing, knowledge management, and local leadership (Aries, 2016).

(Porter M. E., The Economic Performance of Regions, 2003) has extensively analyzed the different types of industries operating out of an economy and inferred that regional competitiveness is a function of the proportion of traded, resource dependent and local industries. In essence competitiveness of a region can be leveraged through the plurality of the industrial base and production, and subsequent industrial innovation. At micro-economy level, competitiveness however is a function of firm's ability to compete in markets- national and global. Accelerating competitiveness by improving an economy's productivity and business environment can be determined by Porter's Diamond framework (Porter M. E., Location, Competition, and Economic Development: Local Clusters in a Global Economy, 2000) (Porter & Ketels, 2003).

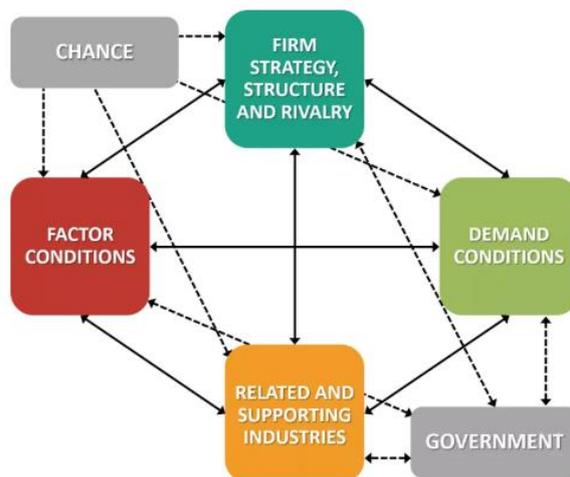


Figure 1: Porter's Diamond Model of Competitive Advantage

Delving deeper to the individual forces that constitute the Porter's diamond model: Factor conditions capture the natural endowments, physical infrastructure and connectivity aspects, availability of human resources, etc. Demand Conditions include buyer sophistication and the presence of well integrated firms within the cluster. Meanwhile Firm Strategy & Rivalry sets the context for production process sophistication within the industries, capacity for innovation in the industrial segments, and nature of competitive advantage. Lastly, the component Related & Supporting industries encompasses the indicators like local supplier quality & quantity, value chain breadth, etc. Additionally, the component 'Government' in the diamond-model includes indicators related to the regulatory facilitations provided to the businesses through property rights, efficiency of legal framework in settling disputes, transparency in policy making, property rights etc. While 'Chance' capitulates the possibilities of those events that can affect the operations of a business, such as disease outbreak, violence outbreak, or any major breakthrough in that industry.

Studies mapping the determinants of competitiveness based on the Porter Diamond Framework have been conducted to assess the competitiveness of MSMEs at firm level (Kharub & Sharma, Comparative analyses of competitive advantage using competitive advantage using of MSMEs in Himachal Pradesh), 2017). For the Indian landscape, the overall attractiveness of industries like automobiles (Bhatia J. D., 2016), plastics (Mandal, Porter's Five Forces Analysis of the Indian Plastic Industry, 2011), sports goods (Jhamb P. D., 2016) have been well explored through various determinants of competitiveness. While the Porter's Diamond Framework emphasizes on driving competitiveness by creating a fostering business ecosystem connected through common institutions and shared externalities in a given cluster, (Porter M. E., The Five Competitive Forces that Shape Strategy, 2008) has derived a framework that can be applied to individual firms in an industry, so as to assess the attractiveness levels of the industry and the operating forces that govern a particular industry. He has asserted that it is the industry structure that drives competition and profitability. (Dobbs, 2014) has elaborated upon the Porter's Five Competitiveness forces and provided template consisting of indicators for each and every Competitive force, summarized below:

- **Competitive Rivalry** which encompasses the variables 'industry growth', 'product differentiation', 'switching costs', fixed and/or storage costs', 'capacity expansion', and 'exit barriers'
- **Threat of Buyers/buying groups** which includes the variables 'industry products', 'buyer information', 'buyer backward integration', 'buyer switching costs', buyer profitability'
- **Threat of Supplier/Supplier Groups** which includes 'supplier concentration', 'supplier volume/profit', 'forward integration of suppliers', 'supplier products', and 'supplier substitutes'
- **Threat of New Entrants** that includes 'supply side economies of scale' and demand side benefits of scale' along with 'distribution channels' and 'government policy'
- **Threat of substitutes**

This paper tries to evaluate the competitiveness of the manufacturing sector of an emerging market- sub-national economy of India- state of Andhra Pradesh, which has been recently created after bifurcation of the erstwhile state of Andhra Pradesh into the state of Telangana and the state of Andhra Pradesh (GoI, 2014). By computing the Porter's Diamond for various manufacturing sub-sectors, this paper tries to highlight the drivers of competitiveness for the manufacturing sub-sectors of the state. Further, it tries to do a detailed assessment of major variables forming the determinants of competitiveness viz. Demand Conditions, Factor Conditions, Firm Strategy Structure & Rivalry, and Related and Supporting Industries, Government & Chance for each of the manufacturing sub-sectors.

By associating the industry perception for each of the manufacturing sub-sectors with respective determinants, we not only try to plot the major driver for a particular sector, but also identify the related causes behind the performance/non-performance of that sector towards specific variables. Eventually, the paper leads to associating the government interventions with the perception results and suggests actions that emerging markets can undertake in order to structurally transform their economy.

II. LITERATURE REVIEW

This section details into three broad themes: Clusters as an instrument to building competitiveness, SME productivity and competitiveness in developing countries, and Porter Diamond for various manufacturing sectors in developing countries.

(Porter M. E., 1998) had argued that firms create competitive advantage by locating themselves into a cluster that is highlighted by optimal sharing of resources like transport infrastructure, sophisticated methods of production, continuous innovation in either processes or products. Further, for developing countries economic development can be facilitated by clusters through more internal and regional trade. Cluster Development Programs in developing economies have facilitated the clusters in meeting the targeted outcomes. (Garone & Maffioli, 2016) have studied Brazil's (Sao Paulo and Minas Gerais) local productive arrangement system through testing for the effects of related policy on firms located in these clusters. They found that the beneficiary firms increased their exports by 90% as compared to the firms in control group; employment levels of the firms in treatment group also increased by 17% creating gain in efficiency and positive spillovers. The results being more on less along same lines have also been highlighted by similar studies on clusters of other developing economies (Giuliani, Matta, & Pietrobelli, 2016), indicating the robustness of local linkages driving performance of SMEs located within a geographical location and optimizing shared resources for market access through improved access to new production technologies and organizational innovation (Kutschke, Rese, & Baier, 2016). However, a common challenge remains to build sustainably performing clusters on which extensive research has been carried out, suggesting the pivotal role of cluster-level services & facilitations offered by institutions. While, (Ingstrup, 2013) by studying four different clusters of Denmark, has asserted that cluster facilitation varies by the type of cluster, industry, and skill levels. (Schrammel, 2013) asserts clusters to be self-sufficient on provisioning of services like market information symmetries, personnel procurement, organizing platforms for networking, access to finance & venture capital, foreign trade promotion, technology access etc.

Viewing Small & Medium enterprises as a critical instrument of clusters, SME productivity becomes an important factor to assess competitiveness of the industry. Various strategies have been adopted by developing nations to augment the SME productivity; with SMEs in Malaysia strategically orienting towards greater information and market access through networks for enhanced firm performance (Wan Mohd Nazdrol bin, Abdullah, & Breen, 2013). Meanwhile economies like Indonesia that have chosen to build an export-oriented manufacturing sector, have gone for internationalization of their SMEs so as to increase their profitability through greater market exposure and learning opportunities (GInting, 2014). (Md. Nur, 2018) has emphasized on the determinants of export competitiveness of manufacturing sector by taking the case study of Bangladesh, wherein the factors like access to finance, trade facilitation, and government policies are found to be most significant.

Across industries there is large dispersion in the total factor productivity for manufacturing sectors. (Okada, 2005) has empirically investigated the competitiveness of the manufacturing sectors of Japan, and has found that highly regulated industries such as medical instruments, pharmaceuticals have shown less growth in the Total Factor Productivity as compared to the sectors that are more exposed to both domestic and international competition. Developing countries on the other hand can leverage their competitiveness by either harnessing their resource based industries or integrating themselves into the Complex Product Systems like Automobiles or Electronics Systems (Chaminade & Vang, 2006). Alternatively, (UNCTAD, 2005) highlights the productivity enhancement of SMEs in developing countries through building the local business community for traditional sectors that absorb a majority of regional labour, and linking them with institutional investors- foreign or domestic.

There is a vast pool of literature on Porter Diamond evaluation for various manufacturing activities involving complex assembly products like auto components (Jacob & Jagannathan, 2007), to simple manufacturing and less-capital intensive products like plastics, to highly capital and labour intensive like textile (Rodrigues & Khan, 2015). Similar studies have also been accomplished for MSME clusters (Kharub & Sharma, Investigating the role of Porter Diamond determinants for competitiveness in MSMEs, 2016). This paper tries to assess the competitiveness of manufacturing sector of a developing economy at sub-national level, by constructing Porter's Diamond for select manufacturing activities. Since, developing economies are characterized by strong presence of low-medium skilled workforce (Albaladejo & Weiss, 2017), the scope of this study is limited to labour intensive manufacturing sectors and evaluating their competitiveness.

III. METHODOLOGY

3.1 Study Design

The state of Andhra Pradesh has been conducting an annual assessment of its competitiveness since 2015. Back in 2015, it entered into a Memorandum of Understanding with the World Economic Forum for benchmarking itself against the global economies in terms of competitiveness. The first competitiveness assessment for the state was done in collaboration with the World Economic Forum and the Confederation of Indian Industries. The Global Competitiveness Index is a benchmarking tool developed in consonance with Porter’s Framework of Competitiveness and includes both quantitative and qualitative aspects of assessment (Schwab, 2018). Whilst the qualitative aspect includes the survey of the business community and capturing their perceptions on various facets of competitiveness; the quantitative component is the aggregation of many indicators pertaining to the macro-economic environment, human development indicators etc. pooled in from international and national databases.

This paper originates from the competitiveness opinion survey data collected for the state of Andhra Pradesh for the year 2018-19. Sampling frame is decided by keeping in mind the structure of the economy; for Andhra Pradesh the agriculture-industries-services share in 2018 was 31%-24%-45%. Hence the sampling frame consisted of entrepreneurs proportionately representing this mix. Another important point to be noted is the geographical spread of the survey, which encompassed entrepreneurs from all the thirteen districts of the state.

The responses against each indicator for the determinants in Porter’s Diamond were captured on a Likert Scale ranging from 1-7, with representation for each score number indicated in the questionnaire (Appendix 1). Shortlisting the MSMEs from the data collected, we got entrepreneurial perceptions from 193 establishments that were surveyed. These establishments ranged from low skill labor intensive sectors like metal casting, auto repair, and basic food processing activities to semi-skilled sectors like textiles & apparel, electronics assembly, etc. to high skill capital intensive sectors like petrochemicals and pharmaceuticals.

Table 1 below summarizes the number of manufacturing establishments surveyed across each product category. It is evident that Food Processing, Textiles & Apparel, Minerals & Metals, and Heavy Engineering (Heavy Machinery & Construction taken together as one category) emerge as major sectors of the economy employing most of the state’s labor force. Other manufacturing industries, carrying a smaller representation are however not analyzed in depth through the Porter Diamond.

Table 1: Category of Manufacturing Units & Distribution of firms

PRODUCT CATEGORY	MANUFACTURING ESTABLISHMENTS CAPTURED
FOOD PROCESSING	49
TEXTILES & APPAREL	46
MINERALS & METALS	33
HEAVY MACHINERY	12
CONSTRUCTION	12
PETROCHEMICALS & CHEMICALS	13
PAPER & PRINTING	10
ELECTRONICS & ELECTRICAL	7
PLASTICS	6
PHARMACEUTICALS	4
TOTAL	193

3.2 Descriptive Statistics Analysis of determinants of competitiveness

Since the responses against the questions asked in the Opinion Survey carry a strong perception component, descriptive analysis of the data is done to find the mean for the indicators grouped under the Six determinants of Competitiveness. The descriptive statistics were analyzed both inter-industry and intra-industry. While the intra-industry analysis of the perception variables gives a holistic picture of the determinants and variables constituting the competitiveness of that sector; the inter-industry analysis positions the status of a particular indicator for each industry and identifies the industry where it has the weakest linkage.

3.3 Porter Diamond Analysis

Porter Diamond Analysis is done on each select manufacturing sub-sector. The lengths of the diamond axes in the analysis represent the strength of linkage of different determinants of competitiveness with each other. Alternatively, the Diamond Area analysis represents the strength of the particular manufacturing sub-sector. For all the four manufacturing sub-sectors studied, competitiveness is investigated through the business perception data.

3.4 Hypothesis

While analyzing the Porter Diamond for each manufacturing sub-sector, we also test for the following hypothesis:

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Hypothesis1: Economies in transition from factor driven to investment driven stage, have a key role of Government in driving the competitiveness of their manufacturing sectors

IV. EMPIRICAL FINDINGS & ANALYSIS

4.1 PORTER'S DIAMOND MODEL

4.1.1 **Food Processing:** The 49 food processing establishments surveyed include activities like horticulture processing, milling, marine food processing (includes fishes, shrimps, prawns etc.), fruit processing (pickle making, jelly making etc.), meat processing, edible oil refining, dairy products manufacturing, etc. Since the Food processing sector in developing countries is highly intertwined with the agriculture sector (Agarwal & Neogi, 2017), the state of Andhra Pradesh with an agriculture share of nearly 30% has a huge presence of food-processing establishments across all its districts.

Nature of this Industry in developing countries is that requiring low skill and being highly labor intensive, with a large domestic spread of input linkages sources from within the economy (Jongwanich & Nedelyn, 2009); The industry at large is quite fragmented with a large number of small sector firms. The presence of high level of informality and only a few conglomerates deters the industry from achieving the economies of scale (Kapoor & Sharma, 2016). Also, because of low investments in transportation and storage, most of the produce does not go through a rigorous harmonization and quality control process in the face of export competition (Trienekens & Zuurbier, 2007); exposing it to local markets with lesser buyer preferences and selling at significantly lower prices.

- For sub-national economy of Andhra Pradesh, **Factor Conditions** are at a better position, with a mean score of 4.80 out of 7. Food Processing sector in the state receives quality power supply for its operations, and has an access to quality infrastructure (ports & roads) that give it a good market exposure. However, the sector does not have strong linkages between university-industry-research that deters product development and hence catering to wider global markets.
- **Demand Conditions** for the food processing industry are strong, with a mean score of 4.97 out of 7. As the industry faces a high stringency of environmental regulations, the prospects of product innovation are higher for this sector. Value of 4.9 on the indicator 'Government procurement of advanced technology products' is yet another positive signal for the sector as it renders room for productivity enhancement.
- **Related & Supporting Industries** the sector shows a weaker value (4.74) as compared to other manufacturing sub-sectors. This is due to the sparse local availability of specialized training services that can upgrade the skill levels of the work-force to global market levels. The strength of clusters in terms of raw material availability and backward linkages is relatively stronger as compared to other manufacturing sub-sectors. However, limited availability of latest technologies is not deterring the sector from achieving export-led competitiveness.
- For the fourth determinant '**Firm Strategy Structure & Rivalry**', FDI and related technology transfer is comparatively faster for the food processing sector due to open-ness of the sector for foreign investments and the related spillovers in technology that accrue from it. However, capacity for innovation among the manufacturing firms of the state and Intellectual property protection remains a serious glitch that is limiting competitiveness.
- For the Porter Determinant of '**Government**', the food processing sector is facilitated by a dedicated policy that spreads across specific products and is looked into by a defined institutional agency (Andhra Pradesh, 2015) .
- Lastly, over the Porter determinant '**Chance**', the food processing sector shows a very strong score of 5.22 on 7. This is mainly because of lesser susceptibility of the industry to violent out-breaks and disease out-breaks. In fact, food processing activity in Andhra Pradesh is driven by the determinant of Chance.

4.1.2 **Textile & Apparel:** The Textile & Apparel Sector contributes significantly to the total exports and employment generation. (India Brand Equity Foundation, 2017). The 46 Textile & Apparel Establishments surveyed include spinning mills, cotton mills, textile mills, handlooms, etc. The industry is characterized by low labor costs and vertically integrated production facilities (Kim, 2019). However, the skilling aspect for labor force varies across the two segments with textile being semi-skilled and capital intensive, and apparel as low-skill labor intensive.

- Among the **Factor Conditions**, the Textile and Apparel Industry faces strong infrastructure connectivity in terms of roads and electricity supply quality. However, the industry reports lower values for Quality of port infrastructure, highlighting the not so strong terms of trade for related cargo and cabotage, which are not making the sector export-

competitive and curtailing the products only to the domestic markets. The MSMEs in this sector is also supplemented with the robust financial instruments and incentives.

- For **Demand conditions**, the sector bears a higher value for the indicator 'stringency of environmental conditions' which point towards the scope of product innovation and making it eco-friendly. As per the perception of the business community, since buyer sophistication is low in this particular sector, most of the MSMEs related to garment manufacturing continue to remain small and cater to small sized orders based on seasonal demands of local customer.
- **Related & Supporting industries** have the highest value (4.90) among all the studied manufacturing sub-sectors. Although the business perception on supplier quality and quantity is strong, one of the critical issues in garment manufacturing sector has been the highly fragmented value chain which prevents the sector from modernizing, scaling-up, and changing the product mix and become increasingly export-competitive (Verma, 2002). This goes in line with the mediocre state of development of the related clusters (value 4.69). Also, the value for indicator 'Local availability of specialized training services' is highest for this sector (4.67), which is due to the fact that many skill development programs centered around imparting training on tailoring operate in the state.
- **Firm Strategy Structure & Rivalry** for the Textiles & Apparel Sector carries a score of 5.00. This is constituted by the sector's strong performance over the indicators: 'production process sophistication', 'Degree of Customer Orientation', 'Extent of Marketing', and 'Intellectual Property Protection'. Though the capacity for innovation and company spending on R&D is lower for the local firms, firm level technology absorption is higher (5.23) than the food-processing sector. This goes well in line with (Varukolu, 2009), that states level of technology adoption by a firm is significantly positively related with the firm's size.
- **Government** policies and incentives are one of the critical levers for this sector that drive its competitiveness. Establishment of Textile Park in the State has facilitated many MSMEs in terms of availing the common facilitation centers and a streamlined regulatory approval process. Scores from the perception data also highlight this through higher value over this determinant for all the selected indicators.
- The Textile & Apparel sector has the largest score over the Porter determinant '**Chance**' (5.50), among all the studied manufacturing sub-sectors. This shows that the sector is less exposed to the random outbreaks of violence and diseases.

4.1.3 **Minerals & Metals:** The 33 establishments studied under this category include iron & steel manufacturing, steel fabrication, granite cutting, refractory bricks manufacturing, cast iron manufacturing, lead and lead-related alloys manufacturing, ceramic tiles manufacturing, etc. Developing economies that have availability of natural endowments like iron ores, coal, and other minerals enjoy relative comparative advantage over other economies. Such capital intensive industries not only produce outputs in higher volumes but also employ a greater number of labor (Burange & Yamini, 2008). The Indian Iron & Steel sector is driven by a strong and growing demand for steel-domestic & international, huge pool of medium-skilled labor-force working at competitive costs (RBSA Valuation Advisors, 2018).

- Among the **Factor Conditions**, business perception of Minerals & Metals industry highlights the good quality of overall infrastructure connectivity offered by the state of Andhra Pradesh. Also, the industry perception on the indicators of presence of skilled labor force and a scientific knowledge base are stronger as compared to all the other manufacturing sub-sectors studied. In essence scores on, 'Quality of scientific Research Institutions' (4.87), 'University Industry Research Collaboration' (4.67), and 'Availability of scientists & engineers' (5.20) vets the fact that a large pool of human resource is available for getting absorbed in the sector.
- **Demand Conditions** are very poor for this sector due to least buyer sophistication. As a result, the domestic firms might not be incentivized to expand their scale and cater to global markets. Also, a lesser score on 'stringency of environmental regulations' highlights the polluting nature of these industries and the scope for modernization and capacity expansion by shifting to newer technologies.
- For **Related & Supporting Industries**, besides the sector having developed clusters with related ancillary firms, the local quality and quantity of suppliers remains an issue. This points towards the vitality of building construction standards and codes, which institutionalize the suppliers to feed quality material into the value chain. Alternately, the presence of an indigenous mining sector has supported the industries in this sector by making raw material available at fairly lower costs and hence reducing the scenario of sourcing the raw material (KPMG, 2008).
- **Firm Strategy Structure & Rivalry** is the driving determinant of competitiveness for this Industry. However, descriptive statistics of sub-indicators constituting this determinant do not offer a very promising outlook of the industry in terms of global competitiveness. Production process sophistication of industries is average as compared with International benchmarks. Also, in terms of Value Chain breadth the sector does not offer many products across the value chain. Further, expenditure on R&D activities by this sector has been much below the global norms.

With domestic firms having average levels of capacity for innovation (5.03), it becomes imperative for the state to channelize the incoming FDI in this sector towards technology upgradation.

- For the determinant ‘**Government**’, certain policy initiatives taken by the state government like reduction in customs duty for all primary and secondary metals and opening certain key metals for private investments has yielded a strong positive business perception.

4.1.4 **Heavy Engineering:** The establishments studied under this category include manufacturing activities like assembly and fabrication of automobile components, manufacturing of industrial filters, manufacturing of electric motors & transformer components, manufacturing of heat exchanger & pressure vessel etc. As fixed inputs to this sector are capital investment and skilled labor force, it is dominated by large organized players. The nature of exports from this sector have evolved from low value goods exported to developing countries to more sophisticated goods channelized to the next stage of global value chain in developed economies (IICCI, 2009).

- **Factor Conditions**, are noted to be the highest for this sector among all the studied manufacturing sub-sectors, from the existing sample data. In essence, the quality of overall infrastructure and port infrastructure are the key facilitators to this sector; also, easy access to financing through various government schemes is also a performance driver for this sector. Though the business perception over ‘University-Industry Research collaboration’ is the strong (4.73), perception over the ‘Quality of Scientific Research Institutions’ and ‘Availability of Scientists & Engineers’ has a lower value indicating towards the research collaborations and quality manpower that have to be built up.
- **Demand Conditions** for this sector are the strongest among all the studies manufacturing sub-sectors. This is primarily because of the high degree of buyer sophistication and government procurement of advanced technology products. Also, the rise in exports which reached USD 65 bn in 2017 (IBEF, 2018) have contributed significantly to the rise in production levels from this sector.
- For **Related & Supporting Industries**, development of existing clusters in the state of Andhra Pradesh has been assigned with the highest perception scores. Also, availability of the latest technology for this sector is higher owing to the nature of final produced output. (Almodovar & Teixeira, 2014) highlight the significance of knowledge networks that have huge spillover effects on the activities of the associated firms. The case of Andhra Pradesh is characterized by a wide range of institutions of higher education, that can provide the sector with manpower. These forward and backward linkages drive the industry with a strong positive multiplier effect, contributing to the economic growth (Dixit & Joshi, 2011).
- Business perception over **Firm Strategy Structure & Rivalry** for this Industry is the highest (5.09) amongst all the studied manufacturing sub-sectors. The main contributors to this perception are High Capacity for innovation in the industry, higher degree of company spending on R&D and higher levels of firm level technology adoption. Also, business perception is highest for Intellectual Property Protection in this sector.
- **Government** facilitation is the driver to competitiveness for Heavy Engineering Sector in state of Andhra Pradesh. In essence, the sector has gained massively from the SEZs, Industrial parks, and Industrial Corridors across the state of Andhra Pradesh. Also, the incentives for various R&D activities provided by the Government (Technology Acquisition Fund Programme) have enabled the growth of this sector in the state.

4.2 DIAMOND ANALYSIS & AXES LENGTH ANALYSIS

Table 2 summarizes the scores on the Six-Porter determinants for all the manufacturing sub-sectors analyzed above (Food Processing, Textile & Apparel, Minerals & Metals, and Heavy Engineering). It highlights the major determinant that drives the competitiveness of each sector, for the sub-national economy of Andhra Pradesh. Figure 2 shows the constructed Porter diamond from these scores for the four manufacturing sub-sectors.

Table 2: Scores on Determinants of Porter Diamond for the four manufacturing sub-sectors

SCORES ON A SCALE OF 1-7	Food Processing	Textile & Apparel	Minerals & Metals	Heavy Engineering
Factor Conditions	4.80	4.75	4.8	4.86
Firm Strategy Structure & Rivalry	4.91	5.00	4.92	5.09
Demand Conditions	4.97	4.89	4.79	5.14
Related & Supporting industries	4.74	4.90	4.76	4.79
Government	5.02	5.19	4.90	5.27

Chance	5.22	5.50	4.87	4.73
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In the table above, top two determinants for each sector are highlighted in green

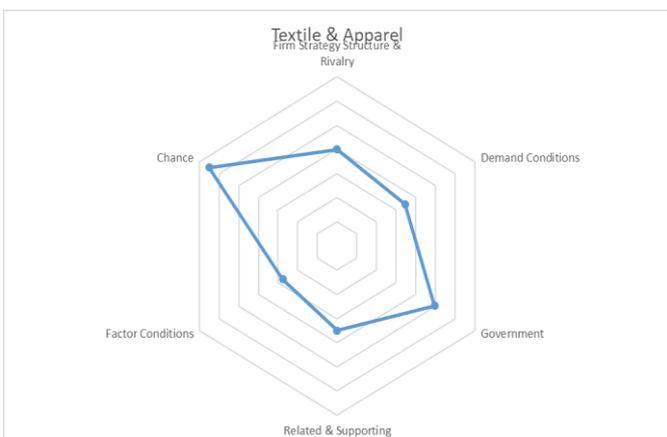
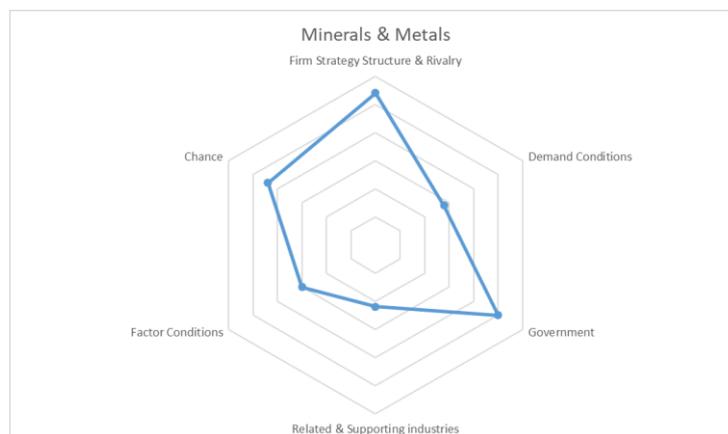
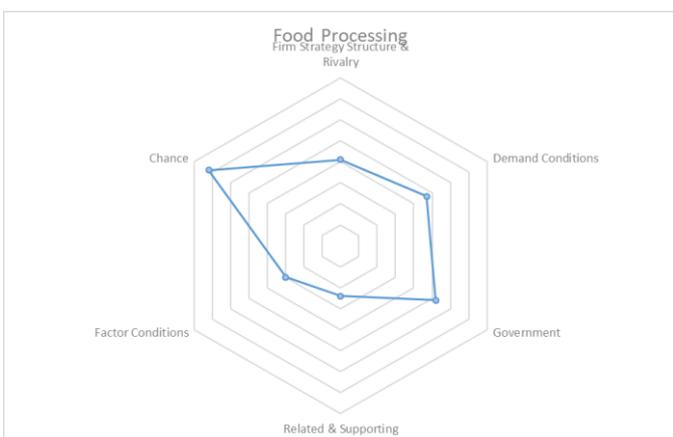
It can be observed from Table 2 that score on the determinants ‘Government’ has been among the highest two out of all the determinants. This validates the Hypothesis 1: Economies in transition from factor driven to investment driven stage, have a key role of Government in driving the competitiveness of their manufacturing sectors

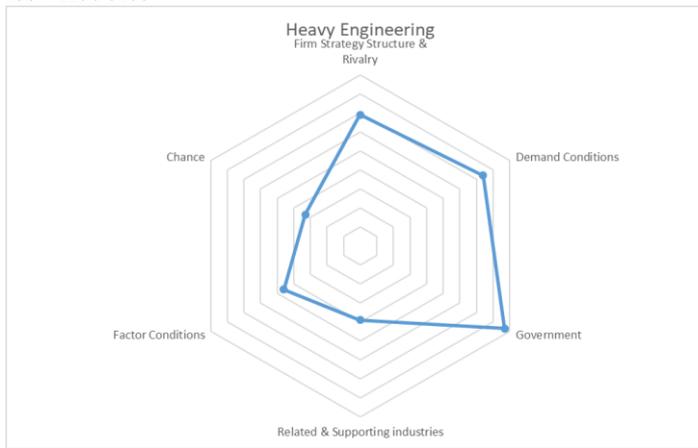
For analyzing the relationships between the Porter Determinants, we reduce the hexagonal figure into a four-sided quadrilateral and take only those parameters that are worked upon by firms endogenously for impacting their business performance. By doing so, the determinants of ‘Chance’ & ‘Government’ are kept out and we observe the dynamics between the remaining four determinants, i.e. ‘Firm Strategy & Rivalry’, ‘Factor Conditions’, ‘Demand Condition’, and ‘Related and Supporting Industries’.

Table 3: Axes length between the Porter Determinants

AXES LENGTH (maximum 9.89)	Food Processing	Textile & Apparel	Minerals & Metals	Heavy Engineering
FACTOR CONDITIONS TO FIRM STRATEGY	6.87	6.90	6.87	7.04
FIRM STRATEGY TO DEMAND CONDITIONS	6.99	6.99	6.87	7.23
DEMAND CONDITIONS TO RELATED & SUPPORTING INDUSTRIES	6.87	6.92	6.75	7.03
RELATED & SUPPORTING INDUSTRIES TO FACTOR CONDITIONS	6.75	6.82	6.76	6.82
DIAGONAL 1 (maximum 14)	9.65	9.90	9.68	9.88
DIAGONAL 2 (maximum 14)	9.77	9.64	9.59	10.00
AREA	47.14	47.72	46.42	49.40

Figure 2: Porter Diamond





From Table 3 the following observations can be made:

- For Food-Processing & Textile & Apparel establishments the strongest linkage that can drive competitiveness is Firm Strategy and Demand Conditions
- For manufacturing units in Minerals & Metals, firm strategy is linked to the factor and demand conditions; and this linkage can drive competitiveness of the sub-sector
- For manufacturing units in Heavy Engineering, the strongest linkage that can drive competitiveness is between Firm Strategy & Demand Conditions

(Dogl, Holtbrugge, & Schuster, 2012) have built on Porter’s argument of competitiveness through the diamond area. In essence, a large diamond is indicative of higher competitiveness while smaller diamond area represents low competitiveness. Table 3 summarizes the diamond-area of the studied manufacturing sub-sectors. It is clear that the Heavy Engineering Industry in Andhra Pradesh is the most competitive. This is followed by the Textile & Apparel and Food Processing Industry respectively.

V. CONCLUSION

It is hence observed that for Andhra Pradesh, a sub-national Indian economy in transition from Factor driven to investment driven stage:

- There is an abundance of labour-force which is mostly semi-skilled. Hence the labour intensive manufacturing sectors like Food Processing & Textile & Apparel, that currently build their competitiveness based on the Government facilitations and Chance (primarily computed by health of the labour force and their ability to work), have to undertake a series of steps so as to remain competitive in the global markets: a) Professional Management of the Labour, b) Degree of Customer Orientation to be enhanced so as to cater to global markets by following their product quality standards
- Capital as well as Labour Intensive manufacturing sector such as Minerals & Metals and Heavy Engineering which is already embedded into the national value chain should undertake a series of steps so as to elevate its competitiveness and integrate itself to the global value chain: a) Strengthen the University-Industry research collaboration so as to increase the innovation potential, b) Coordinate efforts to increase the availability of specialized research and training services for mid & senior level personnel, c) Strengthen the local supplier quality and quantity as per the international product standards, d) Expand the value chain breadth of the products offered so as to cater to a large market network.

APPENDIX

DESCRIPTIVE STATISTICS (MEAN VALUES)					
Factor conditions		Food Processing	Textiles & Apparel	Minerals & Metals	Heavy Engineering
FC1	Quality of overall infrastructure	4.91	4.78	5.24	5.36

FC2	Quality of port infrastructure	4.91	4.40	4.77	4.89
FC3	Quality of electricity supply	5.26	5.36	5.15	5.09
FC4	Ease of access to loans	4.85	4.53	4.52	5.18
FC5	Venture capital availability	4.67	4.57	4.44	4.55
FC6	financing through local equities market	4.65	4.85	4.31	4.80
FC7	Quality of scientific research institutions	4.52	4.62	4.87	4.45
FC8	University industry research collaboration	4.35	4.43	4.67	4.73
FC9	Availability of scientists and engineers	5.09	5.19	5.20	4.73
		4.80	4.75	4.80	4.86
Demand conditions					
DC1	Government procurement of advanced technology products	4.90	4.78	4.77	5.30
DC2	Government success in ICT promotion	5.11	4.93	5.09	5.27
DC3	Buyer sophistication	4.78	4.61	4.43	5.18
DC4	Stringency of environmental regulations	5.11	5.23	4.87	4.82
		4.97	4.89	4.79	5.14
Related and Supporting Industries					
RS1	Availability of latest technologies	5.17	5.22	5.16	5.50
RS2	Local supplier quantity	4.79	4.88	4.68	4.82
RS3	Local supplier quality	4.70	5.03	4.52	4.64
RS4	Local availability of specialized research and training services	4.26	4.67	4.61	4.10
RS5	State of cluster development	4.80	4.69	4.83	4.91
		4.74	4.90	4.76	4.79
Firm Strategy Structure & Rivalry					
FS1	Firm level technology absorption	5.06	5.23	5.18	5.55
FS2	Company spending on R&D	4.85	4.85	4.97	5.09
FS3	Nature of Competitive Advantage	4.52	4.60	4.50	4.91
FS4	Value chain breath	4.83	4.56	4.55	4.55
FS5	Capacity for innovation	4.94	4.95	5.03	5.27
FS6	Production process sophistication	4.85	5.02	4.74	4.91
FS7	Extent of marketing	4.92	5.00	4.97	4.73
FS8	Degree of Customer orientation	5.17	5.34	5.21	5.18
FS9	FDI and technology transfer	5.11	5.00	5.03	5.09
FS10	Intellectual property protection	4.89	5.48	4.97	5.64
		4.91	5.00	4.92	5.09
Government					
G1	Transparency of Government Policy Making	5.17	5.02	4.55	5.00
G2	Judicial independence	5.02	5.00	4.67	5.36
G3	Efficiency of legal framework	4.87	5.11	4.67	5.18
G4	Property rights	4.98	5.56	5.19	5.64
		5.02	5.19	4.90	5.27
Chance					
C1	Business costs of terrorism	5.28	5.95	4.81	5.00
C2	Business costs of crime and violence	5.24	5.59	5.06	5.18
C3	Business costs of malaria	4.93	5.32	4.68	4.55
C4	Business costs of tuberculosis	5.52	5.24	4.96	4.44
C5	Business costs of HIV/AIDS	5.13	5.41	4.83	4.50
		5.22	5.50	4.87	4.73

Acknowledgement

I would sincerely like to thank Secretary Planning Department and Directorate of Economics & Statistics, Government of Andhra Pradesh for facilitating the Global Competitiveness Index Survey for the State and appointing me as the project lead. This study, which spans across the entire state of Andhra Pradesh, could not have been possible without their support and coordination.

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Regular Integrated Health Service Visit as a Dominant Factor of Stunting among Children Aged 6-23 Months in Bogor, Indonesia

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DOI: 10.29322/IJSRP.10.09.2020.p10528

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10528>

Abstract- Stunting is defined as height-for-age Z-score (HAZ) that is below -2 SD of WHO's median growth standard for children. This study aims to determine the dominant factor of stunting in children aged 6-23 months in Babakan Madang District, Bogor Regency, West Java, Indonesia in 2019. This study is a secondary data analysis used a cross-sectional design, with a total sample of 283 children. The dependent variable used is stunting, while the independent variables are family income, maternal education level, maternal age on pregnancy, maternal height, colostrum feeding, age of introducing complementary foods, and integrated health service visit. The result showed that the prevalence of stunting reached 33,2 percent (included in the high category according to WHO classification). The result of bivariate analysis showed that there was a relationship between integrated health service visit and stunting. The result of multivariate analysis showed that regular integrated health service visit were the dominant factor in the incidence of stunting (OR: 2.102; 95% CI 1,268-3,486). Based on the results of study, suggestions for integrated health service is setting a regular time for integrated health service and routinely providing counselling related to nutrition and health for mother and child. Suggestions for the community is to participate actively in integrated health service activities. Suggestions for the other researchers is conducting research with a broader scope.

Index Terms- Children aged 6-23 months, regular visits to integrated health service, stunting

I. INTRODUCTION

Stunting is a delay in the growth of children caused by poor diet or recurrent infections. A child is said to be stunting if the indicator for height-for-age Z-score (HAZ) is below -2 Standard Deviation (SD) from the median growth standard of children belonging to the WHO [1].

Stunted children will have short and long term consequences. Short-term consequences include an increase in the incidence of morbidity and mortality; not optimal cognitive, motor, and language development, and increased health costs [2]. Meanwhile, the long-term consequences include learning capacity and performance that is less than optimal during school; shorter posture than normal people as an adult; an

increased risk of metabolic disorders in adulthood, such as diabetes mellitus, obesity, stroke, and heart disease; decreased reproductive health; and not optimal work capacity and productivity [2].

In 2018, around 149 million children under five in the world were stunted [3]. In 2016, 87 million children in Asia were stunted [4]. In 2015, Indonesia had the highest stunting prevalence in ASEAN, 8.9 million children under five were stunted [5]. In 2013, the prevalence of stunting among children under five in Indonesia was 37.2 percent [6]. Meanwhile, in 2018 it decreased to 29.9 percent in children under two and 30.8 percent in children under five. This is a problem because the prevalence of stunting is considered as public health problem if the incidence is 20 percent or more [7].

Stunting can be caused by various things: maternal and home environmental factors, poor quality foods, inadequate complementary feeding practices, poor food and water safety, inadequate breastfeeding practices, and clinical and sub-clinical infections. These factors are influenced by indirect factors: political economy; health and healthcare; education; society and culture; agriculture and food systems; water, sanitation, and environment [2].

Integrated health service is a form of Community Based Health Efforts which are managed from, by, for, and with the community, in order to empower the community and provide easiness to the community in obtaining basic health services. Efforts to improve the role and function of integrated health service are not only the responsibility of the government, but all components in the community, including cadres (community members who work voluntarily). The role of cadres in organizing integrated health service is very big because cadres have responsibility to provide health information to the community and also motivate community to come to integrated health service and have the clean and healthy lifestyle behavior [8]. In its implementation, integrated health service has 5 table services: registration's table, height and weigh measuring's table, results recording's table, counseling and nutrition service's table for children and mother, and health service's table which includes health checks and worm medicine feeding [9]. Integrated health service activities have 5 main priority programs which include family planning, maternal and child health, nutrition, immunization, and overcoming diarrhea [10]. Integrated health service's cadres also providing education about exclusive breastfeeding and complementary feeding [11].

This study aims to knowing the prevalence of stunting in children under two; knowing the relationship between family income, maternal education level, maternal age on pregnancy, maternal height, colostrum feeding, age of introducing complementary foods, and integrated health service visit with the incidence of stunting in children under two; and knowing the dominant factor of stunting in children under two in Babakan Madang District, Bogor Regency, West Java, Indonesia.

II. METHODS

This study used a cross-sectional design. The strengths of cross sectional design are relatively quick and inexpensive to conduct, data on all variables are only collected at one time point, and many findings can be used to create an in-depth research study, meanwhile the weaknesses are difficult to make a causal inference, associations identified might be difficult to interpret, and not good for studying rare diseases [12]. Researcher used secondary data: Nutrition and Health Survey for Babakan Madang Children Under Five in 2019. The independent variables in this study are family income, maternal education level, maternal age on pregnancy, maternal height, colostrum feeding, age of introducing complementary foods, and integrated health service visit.

The inclusion criteria were children aged 6-23 months who lived with the biological mother. If there are 2/more children aged 6-23 months in the family, then the youngest is chosen. Meanwhile, the exclusion criteria were children with mental disorders, physical disabilities, congenital diseases, and twins.

The complete data available who met the inclusion and exclusion criteria are 283 children. To find out whether the number of research samples have met the minimum requirements or not, it is necessary to calculate the value of the statistical power (1-β). Research in the public health sector must have a statistical power ≥80 percent. The calculation used the hypothesis test formula with a difference of 2 proportions to see a significant difference between the exposed and unexposed group to risk factors [13].

Data analysis was carried out in 3 stages: univariate, bivariate, and multivariate using SPSS 25.0 application. Univariate analysis was used to see the description of the frequency distribution of nutritional status based on the HAZ-score index, individual characteristics of children under two (age and sex), socioeconomic conditions (father and mother's job, family income, and father and mother's education level), maternal age on pregnancy, maternal height, colostrum feeding, age of introducing complementary foods, and integrated health service visit.

Bivariate analysis was used to see the difference in the proportion between family income, maternal education level, maternal age on pregnancy, maternal height, colostrum feeding, age of introducing complementary foods, and integrated health service visit for stunted and non-stunted children aged 6-23 months. Bivariate analysis used the chi

square test with 2x2 cross tabulation. A risk analysis is performed using the Odds Ratio (OR) calculation. Bivariate analysis using 95 percent Confidence Interval (CI) with α: 0.05. P-value <0.05 is a cut-off that indicates statistical significance [14].

Multivariate analysis is used to see which independent variable has the greatest influence on stunting and whether the independent variable is related to the dependent variable is influenced by other variables or not. The test used is multiple logistic regression because both the dependent and independent variables are categorical and the dependent variable is dichotomous. Before conducting multivariate analysis, researcher selected independent variables using simple logistic regression test. If the bivariate analysis produces a p-value <0.25, the independent variable will enter the multivariate analysis stage. However, if there is an independent variable after the bivariate analysis results in a p-value > 0.25, but it is considered important in substance, the variable will enter the multivariate analysis stage. Then, the researcher reselected the independent variable with a p-value >0.05. The greater the OR value, the greater the independent variable affects the dependent variable.

HAZ-score index is categorized into stunting and non-stunting. Family income was categorized by Bogor Regency Minimum Wage into low (<Rp 3.760.000) and high (≥Rp 3.760.000). Maternal education was categorized into low (not in school, elementary, junior, and high school graduated) and high (Diploma 1/2/3 and Bachelor/Master). Maternal age on pregnancy was categorized into risk (≤19 and >35 years) and not at risk (20-35 years). Maternal height was categorized into short (<150 cm) and normal (≥150 cm). Colostrum feeding is categorized as not given and given. The age of introducing complementary foods was categorized into early (0-6 months of age) and normal (more than 6 months). Integrated health service visit was categorized as irregular (if only 1-5 visits) and regular (6 visits) in the last 6 months.

III. RESULT

Table 1. Distribution of Children Under Two

Variable	Category	Frequency (n)	Percentage (%)	
Nutritional status	Severely stunted	35	12,4	
	Stunted	59	20,8	
	Normal	169	59,7	
	Tall	20	7,1	
Age	6 months	25	8,8	
	7-11 months	79	27,9	
	12-23 months	179	63,3	
Sex	Male	141	49,8	
	Female	142	50,2	
Father's job	Not working	1	0,4	
	Government employee / Indonesian National Army / Indonesian Republic Police	3	1,1	
	Private employee	66	23,3	
	Trader / entrepreneur	76	26,9	
	Labor / service	128	45,2	
	Other	9	3,2	
	Mother's job	Not working	249	88,0
		Government employee / Indonesian National Army / Indonesian Republic	2	0,7

	Police		
	Private employee	2	0,7
	Trader / entrepreneur	17	6,0
	Labor / service	11	3,9
	Other	9	0,7
Family income	Low	188	66,4
	High	95	33,6
Father's education level	Low	270	95,4
	High	13	4,6
Mother's education level	Low	273	96,4
	High	10	3,6
Maternal age on pregnancy	Risk	73	25,8
	Not at risk	210	74,2
Maternal Height	Short	142	50,2
	Normal	141	49,8
Colostrum feeding	Not given	48	17,0
	Given	235	83,0
Age of introducing complementary foods	Early	198	70,0
	Normal	85	30,0
Integrated health service visit	Irregular	141	49,8
	Regular	142	50,2

The results of this study indicate that the prevalence of stunting is 33.2 percent, while the non-stunting is 66.8 percent. The mean \pm SD index for HAZ-score was -1 ± 1.9 .

The mean \pm SD age of children is 13 ± 5.2 months. There are 49.5 percent boys and 50.5 percent girls.

The majority of fathers' job is labor/services (45.2%), while the majority of mother's job is not working (88%). The majority of family income is classified as low (66.4%). The majority of father and mother's education level is classified as low (father: 95.4%, mother: 96.4%).

The mean \pm SD maternal age on pregnancy is 27 ± 6.3 years. The youngest age is 15 years, while the oldest is 47 years. The majority women pregnant at non-risk age (74.2%).

The mean \pm SD maternal height is 149.8 ± 5.3 cm. The mother's lowest height is 129.5 cm, while the mother's highest height is 165.5 cm. The majority of maternal height is classified as low (50.2%).

The majority of children are given colostrum (83%). The fastest age of introducing complementary foods is 0-7 days, while the latest is more than 6 months. The mean \pm SD age of introducing complementary foods is 4 ± 2.3 months. The majority of children are given early complementary foods (70%). The majority types of complementary foods is instant porridge (143 childrens), formula milk (89 childrens), mashed fruit (88 childrens), biscuits (68 childrens), and rice porridge (54 childrens).

There was 50.2 percent of children went to the integrated health service regularly, while 49.8 percent irregularly. The number of children who did not attend each month from November 2018-April 2019 respectively were 80 childrens (28.8%), 71 childrens (25.5%), 73 childrens (26.3%), 72 childrens (25, 9%), 78 childrens (28.1%), and 93 childrens (33.5%). The reason for the majority of mothers irregularly visit integrated health service was because they forgot / didn't know the schedule of the integrated health service (59 mothers), the integrated health service was off (13 mothers), the mothers were busy (12 mothers), the children did not want

to be weighed (10 mothers), the husband was not allowed mother and child to visit integrated health service (4 mothers), and the children had been taken to the midwife or puskesmas (4 mothers). The mean \pm SD attendance of mothers and children at the integrated health service was 4 ± 2 times.

Table 2. Results of Bivariate Analysis

Variable	Stunted		Non-stunted		Total		p-value
	n	%	n	%	n	%	
Mother's education level							
Low	92	33,7	181	66,3	273	100,0	0,505
High	2	20	8	80	10	100,0	
Maternal age on pregnancy							
Risk	17	23,3	56	76,7	73	100,0	0,052
Not at risk	77	36,7	133	63,3	210	100,0	
Maternal height							
Short	51	35,9	91	64,1	142	100,0	0,400
Normal	43	30,5	98	69,5	141	100,0	
Colostrum feeding							
Not given	16	33,3	32	66,7	48	100,0	1,000
Given	78	33,2	157	66,8	235	100,0	
Age of introducing complementary foods							
Early	67	33,8	131		198	100,0	0,840
Normal	27	31,8	58		85	100,0	
Integrated health service visit							
Irregular	37	26,1	105		142	100,0	0,015*
Regular	57	40,4	84		141	100,0	

*p-value indicates a relationship (p-value <0,05)

There was a relationship between the integrated health service visit and the incidence of stunting (p-value <0.05). Meanwhile, other independent variables have no relationship with the incidence of stunting (p-value >0.05). Although it does not have a relationship, there is a tendency that the incidence of stunting is higher in children with low family income, low levels of maternal education, and low maternal height.

Table 3. Bivariate Selection

Variable	p-value
Family income	0,778
Mother's education	0,505
Maternal age on pregnancy	0,052*
Maternal height	0,400
Colostrum feeding	1,000
Age of introducing complementary foods	0,840
Integrated health service visit	0,015*

*p-value <0,25

Based on table 3, it can be concluded that the independent variables selected to be continued to the multivariate modeling stage (variables with p -value < 0.25) are maternal age on pregnancy and integrated health service visit. However, maternal height and colostrum feeding were included in the multivariate modeling because they were important substances related to the main causes of stunting. Maternal height is one of the direct causes of stunting, where short mother have an inadequate anatomical and metabolic system, such as lower glucose levels and decreased protein and energy reserves, which can lead to IUGR and then stunting [15]. Meanwhile, colostrum contain nutrients and antibodies that are important in preventing infection and nutritional problems, where infection is one of the direct causes of stunting [16].

Colostrum feeding is the variable with the highest p -value, so that variable is excluded first. After removing these variables, a change in the OR of other variables was obtained < 10 percent, then the colostrum feeding variable was permanently removed. The variable with the second highest p -value is maternal height. After removing that variable, the OR changes in other variables was < 10 percent, then the variable maternal height is permanently removed. The variable with the third highest p -value is the maternal age on pregnancy. After removing that variable, a change in the OR of other variables < 10 percent, so that variable is permanently removed.

Table 4. Results of the Final Modeling of Multiple Logistic Regression Analysis

Variable	Coef B	<i>p</i> -value	OR	95% CI
Integrated health service visit	0,743	0,004	2,102	1,268-3,486

After removing three variables in the order of the p -value from the largest, it can be concluded that no confounding variable was found because there were no variables that has a change in OR more than 10 percent. In table 4, it can be stated that regular integrated health service visit are the dominant factor because it has a significant p -value, the greatest OR, and the only variable left in the final modeling. Children who are irregularly visit integrated health service were 2.1 times more risky to experience stunting than children who are regularly visit integrated health service.

IV. DISCUSSION

The prevalence of stunting in this study is 33.2%. When compared with the prevalence of Indonesia (29.9%), the prevalence of stunting in this study is much higher [17]. According to the cut-off classification public health problems for stunting, this prevalence is in the high category [7]. This high prevalence of stunting indicates that it needs immediate treatment and prevention so that the prevalence of stunting does not increase.

Based on the bivariate analysis, it was found that there was no relationship between family income and stunting, which was indicated by p -value < 0.05 . However, there is a tendency for

stunting to occur in low income families. The results of this study is in line with research conducted on children under five in China that there was no relationship between GDP per capita and stunting [18]. This is possible because families with high income do not allocate their income for nutritious food materials, so that both low and high income families have many children who are stunted. However, high income does not mean increasing consumption of nutrients the body needs. Families with high incomes will actually increase the opportunity to choose food ingredients and increase the consumption of foods they like, even though these foods are not rich in nutrients [19].

Based on the bivariate analysis, it was found that there was no relationship between maternal education level and stunting, which was indicated by p -value < 0.05 . However, there is a tendency for stunting to occur in families with a low level of maternal education. The result is contrary to the study in children aged 0-42 months in Nairobi, Africa that maternal education is a strong predictor of child stunting [20]. No relationship between maternal education level and stunting in this study is possible because mother's education level is not a direct cause of stunting [2]. HAZ-score represents a past nutritional history, so regardless of maternal education level, if the baby is already undernourished, it can lead to stunting. The researcher tried to analyze the variables between maternal education level and mother's job. The result showed that 40 percent of mothers with higher education have job, so that mothers is possible not directly care for their children and pay less attention to the children's nutritional status. In addition, behavior is not only influenced by the education level, but also by socio-economic, socio-cultural and environmental factors.

Based on the bivariate analysis, it was found that there was no relationship between maternal age on pregnancy and stunting, which was indicated by p -value < 0.05 . However, there is a tendency for stunting to occur in pregnant women at non-risk age. The result is contrary to the study in children under five in Tamale Metropolis, Ghana that children of teenage mothers were 8 times more likely to be stunted than children of adult mothers [21]. The researcher tried to analyze between maternal age on pregnancy and integrated health service visit variables. The result showed that most mothers with risky ages regularly brought their children to the integrated health service than mothers with not at risk age. If children are not routinely taken to the integrated health service, their body's growth and development is not well monitored, so they can become stunted and are not given immediate treatment. In addition, if the mother does not regularly go to the integrated health service, the mother will have less knowledge of good nutrition for her child.

Based on the bivariate analysis, it was found that there was no relationship between maternal height and stunting, which was indicated by p -value < 0.05 . However, there is a tendency for stunting to occur in mothers with short stature. The result is contrary to the study in infants ages 6-12 months in San Juan Comalapa, Guatemala that maternal height was associated with stunting at both 6 and 12 months [22]. No relationship between maternal height and stunting is possible because the cause of stunting is not only genetic, but there are other factors.

Based on the bivariate analysis, it was found that there was no

relationship between colostrum feeding and stunting, which was indicated by p -value < 0.05 . Mothers who did not give colostrum and who gave colostrum tended to experience stunting. The result is contrary to the study in children aged 6-59 months in Afambo District, Northeast Ethiopia that colostrum feeding was associated with the three indicators of child under nutrition (stunting, underweight, and wasting) [16].

Based on the bivariate analysis, it was found that there was no relationship between the age of introducing complementary foods and stunting, which was indicated by p -value < 0.05 . However, there is a tendency for stunting to occur in children who are given early complementary foods. The result of this study is in line with research conducted on children aged 6-23 months in Tamang Community, Ambhanjyang, Nepal that there was no significant relationship between complementary feeding practices and nutritional status of child [23].

Based on the bivariate analysis, it was found that there was a relationship integrated health service visit and stunting, which was indicated by p -value < 0.05 . There was a tendency for stunting to occur in children who did not regularly attend the integrated health service. The researcher tried to analyze age of introducing complementary foods and colostrum feeding to the integrated health service visit variable, but the result did not show a significant relation. Maybe, other integrated health service roles, such as monitoring routine weight and height measurements, immunization, supplementary feeding, vitamin A capsule feeding, nutrition and health education related to mother and children (exclude education about the age of introducing complementary foods and colostrum feeding) went well, so children who regularly attended the integrated health service were less risk to experience stunting.

The dominant factor in the incidence of stunting is integrated health service visit, with highest OR value: 2.102 (95% CI: 1.268-3.486). These results indicate that if the child irregularly attend the integrated health service every month, will 2.102 times more risky to experience stunting than children who regularly visit integrated health service.

Activities in integrated health service include Tetanus Toxoid vaccine for pregnant women, vitamin A feeding, complete immunization to babies that are carried out to prevent infection in mothers and babies, which are one of the direct causes of stunting. Integrated health service's cadres also provide education about balanced nutrition food for pregnant women can prevent mothers from malnutrition during pregnancy. Education about exclusive breastfeeding and adequate complementary foods for children is also related to the direct causes of stunting. In addition, routine weighing and measuring body length at the integrated health service can certainly monitor the child's growth, so that if a child is at risk or is already experiencing stunting, further action can be given by the community health center (who is the supervisor of integrated health service). Then, integrated health service has activities to check pregnant women's health. This is a good activity for preventing stunting.

V. CONCLUSION

The prevalence of stunting among children aged 6-23 months in this study is in the high category (33.2%). There is a relationship between the variable integrated health service visit with the incidence of stunting, while there is no relationship between other variables with the incidence of stunting. The dominant factor is integrated health service visit. Children who were irregularly visit integrated health service were 2.102 times more likely to experience stunting than children who were regularly visit integrated health service. Suggestion for integrated health service is to set a regular time each month, so that mothers of children can easily remember the schedule. Then, it is hoped that the integrated health service will routinely provide counseling regarding the importance of immunization, healthy food and the appropriate number of portions for pregnant and lactating women, exclusive breastfeeding, and the starting age of complementary feeding, including sufficient types and amounts of complementary foods for infants and toddlers according to their age. The next suggestion is to improve the integrated health service's function so that it runs well, mobilizing cadres to receive training about stunting: its causes, impacts, and ways to prevent and treat stunting. Cadres also need to clarify the socio-cultural myths circulating in society. In addition, cadres are expected to be able to make home visits to pregnant women, mothers of infants and toddlers who do not regularly attend integrated health service and encourage them to attend in next month.

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The difference between gelatinization, endothermic and pasting properties of sago starch and those of other starches

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DOI: 10.29322/IJSRP.10.09.2020.p10529
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10529>

Abstract- Properties of gelatinization, endothermic and pasting behaviour of *Metroxylon sp.* sago starch were studied. Those properties of other starches (*Arenga pinnata*, wheat, corn, and cassava) were also analyzed as a comparison. It was found that *Metroxylon* sago starch had a relatively higher gelatinization temperature and endothermic energy, as well as higher peak viscosity. Many potential applications of these starches in the food industry might be made by knowing these properties, in which the search of underutilized starch sources was being pursued.

Index Terms- Arenga, endothermic energy, gelatinization characteristics, pasting, sago.

I. INTRODUCTION

Like other starches, sago starch has been utilized in many application of food products, either as a main raw material or as an additive, such as food, medicine, paper, plywood, and textile industries. Specifically in the area of food industries, starch has been used as texture shapers, gelling agent, bulking agent, anti sticky agent, edible packaging, and fermentation energy [1], [2], [3], [4]. The use of starch in the food application would be dependent upon several factors, such as obtainability, price, easiness of processing, and the quality impact on the applied final product.

Sago is a commodity that produces large quantities of starches that grows in a stable and sustainable ecosystem dynamic. The plant might grow with variations in climate and acid soil conditions. Sago occupies a very strategic position in Indonesia's food history, especially for residents of coastal or lowland areas [5].

This commodity has a great potential to become a staple food and raw material for starch-based industries because it is well known and well-developed in society. The enormous potential of sago should be utilized for the purpose of finding an underutilized food starch source. A systematic and sustainable development of sago may be a way to secure food sources in the future [6].

There are two major sago starches, i.e. *Metroxylon sp.* and *Arenga sp.*, which have many differences in their properties. The former may produce a lot of starch, up to about 250 kg per palm,

while the latter only produce about 75 kg per palm [7], [8], [9], [10].

Starch properties, such as gelatinization temperature, endothermic energy, and pasting behavior are very essential to be identified before using them in any food formulation. Therefore, the aims of this research was to portray those properties of sago starch. Its properties were then compared to the properties of arenga, wheat, corn and cassava starches.

II. MATERIALS AND METHOD

1) Materials.

The sample of fresh sago starches (*Metroxylon sp.*) was directly obtained from a small sago processing unit in the Village of Lamokula, Regency of South Konawe, in the Province of Southeast Sulawesi, Indonesia. Meanwhile, the other starches (arenga from *Arenga sp.*, wheat, corn, and tapioca) were purchased from a local supermarket.

2) Gelatinization and Endothermic Properties Measurement.

An apparatus of DSC-7 Perkin Elmer, which was calibrated with indium (ΔH 28.45 J/g, melting point 156.6°C), was used to determine the temperature of thermal transition and endothermic energy (ΔH). Approximately 1 g of sample was energetically mixed with deionized distilled water in a glass capped bottle. The ratio of starch/water was 1:2 (dry basis). About 10-15 mg of this mixture was then balanced directly into a 40 μ L DSC pan using a micropipette, then sealed immediately. The wrapped pans were kept to stand for 2 h at 24°C before heating from 20 to 120°C, at a scanning rate of 10°C per min. A blank pan was used as reference. Temperatures of thermal transition of the starch were defined in terms of T_o (onset), T_p (peak), and T_e (end) of temperature of gelatinization. Endothermic energy (ΔH) in J/g was determined by integrating the top area of the DSC endothermic graph.

3) Pasting Properties

An apparatus of Rapid Visco Analyzer (RVA) was used to profile the pasting characteristics of the samples. About 2 g of samples (with 14% moisture basis) were balanced directly into the aluminum canister. Then, exactly 25 mL of deionized distilled water was added.

The test in RVA was performed with a 13 min cycle. Initial test was to calibrate for 1 min at 50°C, followed by heating for 3.75 min to a maximum temperature of 95°C. The sample was hold for 2.5 min at 95°C; cooled for 3.75 min until the temperature reached 50°C; and subsequently hold for 2 min at 50°C [11], [12]. The profile of the pasting characteristics were peak viscosity, temperature and time at which the peak occurred, minimum viscosity, final viscosity, pasting temperature, breakdown rate (the decrease in viscosity between peak and minimum per min), retrogradation rate (the increase in viscosity per min during cooking from 95 to 50°C), and the rate of increase in

III. RESULTS AND DISCUSSION

A. Properties of Thermal Transition and Energy of Endothermic

T_o (onset temperature), T_p (peak temperature), T_e (end temperature), and ΔH (endothermic energy) of the samples are shown in Table 1. Sago, arenga, wheat, corn and tapioca samples had a single endotherm of gelatinization.

TABLE 1

PROPERTIES OF THERMAL TRANSITION AND ENDOTHERMIC ENERGY OF SAGO, ARENGA, WHEAT, CORN AND TAPIOCA STARCHES^{1,2}

Samples	$T_o(^{\circ}C)^3$	$T_p(^{\circ}C)^3$	$T_e(^{\circ}C)^3$	$T_e - T_o$ ($^{\circ}C$) ⁴	ΔH (J/g) ⁵
Sago	68.20 ^a	72.39 ^a	80.74 ^a	12.54 ^a	16.01 ^a
Arenga	64.43 ^b	68.95 ^c	76.93 ^b	12.50 ^a	12.93 ^b
Wheat	53.35 ^c	61.06 ^d	69.87 ^c	14.52 ^b	7.76 ^d
Corn	65.67 ^b	70.05 ^{bc}	76.09 ^b	10.42 ^c	10.91 ^c
Tapioca	62.79 ^d	69.08 ^c	78.49 ^d	15.70 ^d	11.76 ^{bc}

¹The average of triplicates.

²The same superscript were not significantly different ($p < 0.01$).

³ T_o , T_p and T_e in $^{\circ}C$ were the onset, peak, and end of gelatinization temperature.

⁴Range of gelatinization temperature.

⁵Endothermic energy.

The results obtained indicated that the ranges of gelatinization temperature ($T_e - T_o$) fluctuated between 10.4°C and 15.7°C. The temperature ranges of gelatinization for corn starches was not significantly lesser than those reported by the other study [14]. This discrepancy was most likely caused by the difference in rate of heating used during the DSC run, where the present study using a heating rate of 10°C per min while the latter authors used 16°C per min. In a separate study, it was revealed that a higher heating rate in DSC test has given an increase in the ranges of gelatinization temperature [15].

The gelatinization temperature range reflected the quality and homogeneity of the crystalline portion of the starch, which includes uniformity of crystal size and stability [16]. The decrease in temperature ranges indicated that the crystal portion formed is more homogeneous so that it required lower energy or enthalpy to melt.

Enthalpy energy (ΔH) of the starch samples fluctuated between 7.76 and 16.01 J/g. The ΔH for corn starch was higher than that found by Khomsatin et.al. [14] and Waterschoot et al. [17]. The

viscosity during 5°C holding stage. The viscosity was expressed in Rapid Visco Unit (RVU), where one scale of RVU was equivalent to about 12 cPoise.

4) Statistical Analysis

At least three replicates were measured for each sample, and the result average was made. ANOVA (Analysis of variance) was performed using the Minitab® 18.1 statistical package to calculate any statistical differences [13]. To compare among average, a Duncan multiple range test was performed.

value for wheat and cassava starch was slightly similar to that reported by Waterschoot et al.[17].

Gelatinization enthalpy (ΔH) was the heat energy required to release the amylose double helix bonds and destroyed the crystalline part during the gelatinization process. A higher ΔH in sago starch indicated a stronger crystalline amylopectin, making it more difficult to degrade during heating process.

B. Profile of RVA Pasting Properties

Profile of RVA pasting properties of the samples are indicated in Figure 1, meanwhile the summary of the pasting properties is shown in Table 2. It was indicated in Figure 1 that there were several differences of the pasting properties of the samples analyzed.

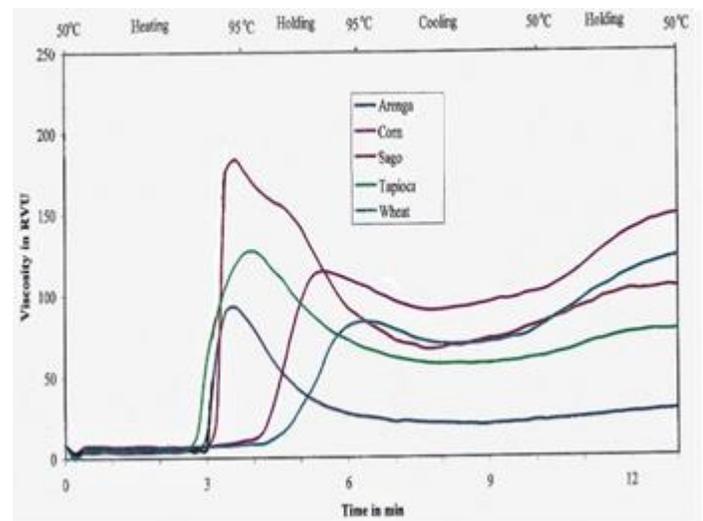


Figure 1. Profile of RVA pasting properties sago, arenga, corn, wheat and tapioca starches.

Figure 1 shows the starch gelatinization profile measured using RVA. The data obtained were peak viscosity, pasting temperature, hot paste viscosity, retrogradation rate, and final viscosity after maintained at 50°C or cold paste viscosity. The results indicated that peak viscosities of the sago starch were significantly higher than those of other starches. This might be caused by the differences in size of granules, where sago starch has the biggest size among the samples [18]. The peak viscosity was achieved at the end of the heating stage when the quantity of

swollen starch particles increased resulting in pasting state [18]. Pasting occurred when there was a combined effect of swelling and rate of disruption of the granules [19]. There was also an indication that peak viscosity was influenced by the water-holding capacity of the starch [20].

As with native starch, sago starch has a gelatinization profile with a high peak viscosity followed by a sharp breakdown viscosity during the heating phase. This showed that the sago starch granules were less resistant or less stable by the heating process. In the cooling phase, the viscosity of the starch paste increased again due to the re-association of amylose and amylopectin molecules through hydrogen bonds. The increase in viscosity during the cooling phase also shows a trend toward retrogradation of the sago starch paste. The high amylose content has a major contribution to the tendency for starch paste retrogradation during the cooling phase [21], [22], [23].

TABLE 2
PROFILES OF RVA PASTING PROPERTIES OF SAGO, ARENGA, WHEAT, CORN AND TAPIOCA STARCHES

RVA pasting properties ^{1,2}	Starch of				
	Sago	Arenga	Wheat	Corn	Tapioca
Peak viscosity (RVU)	185.91a	94.16c	84.73c	117.68d	128.96e
Peak occurred at:					
Temperature (°C)	81.15a	80.78a	95.00c	95.00c	84.98b
Time (min)	3.50a	3.47a	6.34c	5.48d	3.90b
Minimum viscosity (RVU)	65.72a	20.50c	70.42d	89.62c	57.79f
Final viscosity (RVU)	105.79a	28.13c	121.38d	149.92c	76.67f
Pasting temperature (°C)	75.10a	72.95c	93.10c	87.93d	70.98e
Breakdown rate (RVU/min)	26.72a	12.87c	7.93d	10.45cd	18.10e
Retrogradation rate (RVU/min)	5.97a	0.64c	5.96a	6.83a	2.34d
Rate of viscosity increasing before peak (RVU/min)	422.12a	139.66c	40.01d	78.10e	97.48f
Rate of viscosity decrease during 95°C holding time (RVU/min) ³	32.01a	10.83cd	9.27d3	12.13c3	17.19e
Rate of viscosity increase during 50°C holding time (RVU/min)	5.84a	2.32c	12.80d	15.31e	4.36f

¹Means of duplicates

²Mean in row having the same superscript were not significantly different (p<0.01)

³The values were calculated only from the descending slope starting from the peak because the peak was reached after 95°C.

In many industrial application, a high-viscous type of starch must be initially modified to be used in various food formulation. The knowledge of pasting profiles of the starch might help one to choose the appropriate characteristics.

Cold viscosity of the starch showed ability of samples to make a viscous paste or gel after cooking and cooling. As shown in Table 1, sago starch had the most glutinous paste; while arenga samples exhibited the most aqueous paste.

The starting point of granules breakdown was measured from the temperature and time, where the peak started to occur. The present study revealed that sago and tapioca starches have a more vulnerable granules compared to those of wheat and corn starches. This has given rise to a lower peak temperature of sago starch. Peak temperature of wheat and corn starches were similar at 95°C, but the time of peak of corn starch to occur at 5.48 min, earlier than that of wheat starch at 6.34 min. This was probably related to the lipid content of the samples, where wheat contained more lipid than corn. The assumption was that there was a complex between amylose and lipid, in which it would reduce the water binding capacity, the swelling, solubilization of the wheat starch, resulted in a delay of peak time [18].

The increase of viscosity rate of the RVA curves reflected the homogeneity of the granules. The results of this study indicated that wheat and corn starches had less rates in viscosity increase. Their granules might have swollen over a wider range of temperatures, reflecting that a less homogenous distribution of granules. Meanwhile, sago starch which had a higher viscosity rate indicated a less heterogeneous distribution of granules.

The fragility of the granules to swell during shearing and mixing process might be measured in its breakdown rate. The breakdown was difference between the peak and the lowest viscosity reached during the holding stage. The increase and decrease rate of the paste viscosity would rely on the type and amount of starch, temperature gradient, shear force and composition of the mixture [24], [25].

When the temperature was held constant at 95°C for about 2.5 min, the starches showed a high peak, followed by a high swelling power. This had resulted in an easier rupture of the granules and gave a rapid decrease in viscosity [18]. As shown in Table 1, a higher breakdown rate of sago starch indicated a less stable paste, compared to that of wheat and corn starches. Therefore, a chemical modification, such as cross linking, may be needed if sago starch was to be applied into food formulation that require a hot stable paste, such as sterilization or canning. The resistance of starch to mechanical breakdown may be improved through cross-linking modification

A continues temperature increase after the peak would further disintegrate the swollen granules. This would contain exuded amylose, granules fragments, colloid and molecularly dispersed starch molecules [26].

Last phase of the curve, as the cooling stage, was when the granules were cooled and retrogradation took place. As shown in Figure 1, retrogradation occurred after cooling from 95 to 50°C. During retrogradation, there was an increase in viscosity, which was most likely due to the amalgamation of the fragmented and dispersed granules molecules. Sago starch gave a higher rate, compared to other starches. When the temperature was held constant at 50°C for another 2 min, there was an increase of viscosity of all starch samples. This might be due to the formation of a cohesive network during retrogradation stage.

A review by Balet et al [18] revealed that measuring the pasting characteristics of starch with RVA has several advantages over the amylograph, i.e. easiness and versatility to operate, small

sample size (4 g compared to 65 g); flexibility in setting the temperature profile; and the ability to directly record data in a computer system.

IV. CONCLUSION

Gelatinization temperature, endothermic energy, and profile of RVA pasting properties of several starch samples showed that sago starch sample exhibited a less gelatinization temperature range, compared to that of wheat and tapioca, but it was higher than that of corn. Sago starch had the highest endothermic energy of gelatinization. From the RVA pasting profile, sago starch had the highest peak viscosity amongst the starches studied.

Several pasting characteristics of the sago starch may be useful for certain application in food formulation. In this regard, such properties as higher viscosity may be appropriate for thickener and fruit pie filling. On the other hand, vulnerability of sago starch granules during shearing and mixing at hot temperature may need to be modified, if this starch was to be applied in the products such as canned and sterilized foods. Obviously, a more detailed study is needed to confirm the appropriateness of this starch for the future application.

ACKNOWLEDGMENT

We acknowledge for financial support to Department of Food Science & Technology, Universitas Halu Oleo in carrying out the work.

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Nursing Interventions in Woman with Breast Cancer Her2 like supported by Orem's theory. From Adjuvant to Palliative treatment. Study Case

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DOI: 10.29322/IJSRP.10.09.2020.p10530

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p1530>

Abstract- Introduction: Breast Cancer is in Portugal and in the world, the cancer with the highest incidence in women. Nursing care centered on the person and on the interpersonal relationship aims to help women to be proactive in achieving their health project. Faced with an event as disruptive as being diagnosed with Breast Cancer, the woman will need, through a therapeutic relationship, to be supported and taught in the adaptation and self-care strategies related to the emerging health deviation. Focusing on training for self-care through educational and support interventions, we selected the Nursing Theory of Self-Care Deficit developed by Dorothea Orem. The case refers to a woman who was 36 years old at the time of diagnosis (2014) with Multifocal Invasive Ductal Carcinoma Her2 like type.

Objectives: Presentation of a case study based on Orem's nursing theory and identification and systematization of the most relevant nursing interventions to promote the adaptation of women to breast cancer.

Methodology: Research of the patient's clinical process, in the *SCLínico Hospitalar* IT system of ULSLA E.P.E. and a systematic review of the literature in various scientific databases through the website of the Order of Nurses (EBSCO, Cochrane) and on the website of the Portuguese Oncological Nursing Association.

Results: No deficits were identified in the Development Requirements.

The deficits in the Self-Care Requirements related to Health Deviation identified were: breathing, elimination, skin, physical activity, psychological and emotional balance, body image, family and social interaction.

Nursing interventions aimed at promoting adaptation to health status and self-care in deficits related to health deviations, were based on the supportive-educative system.

Conclusions: The case presented here reveals a path of functional adaptation to a very disruptive health deviation from the person's life. She underwent surgical treatment and adjuvant chemotherapy with expectation of cure and initiated palliative treatment with the expectation of living with quality.

The strategies for adapting to health deviations and the management of adverse events (AE) used by the woman under the guidance and monitoring of the Nursing team proved to be appropriate.

Index Terms- Breast Cancer, Nursing Interventions, Self-care, Adaptation, Dorothea Orem.

I. INTRODUCTION

Breast cancer is in Portugal and worldwide, the cancer with the highest incidence in women (1).

The diagnosis of Breast Cancer has a great emotional, psychological, and social impact on women. All dimensions of life are affected, and fears arise related to prognosis and survival.

Nursing care centered on the person and on the interpersonal relationship aims to help her to be proactive in achieving their health project. The quality standards defined by the Order of Nurses that must be in force in nursing care assistance, determines that nurses work in promoting functional adaptation to deficits, often through client learning processes (2). Dorothea Orem argues that all individuals are capable of learning and self-care and that nurses work through compensation systems in the identified self-care deficits (3).

Faced with an event as disruptive as being diagnosed with Breast Cancer, the woman will need, through a therapeutic relationship, to be supported and taught in the adaptation and self-care strategies related to the emerging health deviation (2) (4) (5). Focusing on training for self-care through educational support interventions, we selected the Nursing Theory of Self-Care Deficit developed by Orem, which provides a scientific framework for the implementation of the Nursing Process. This theory was validated by studies of Integrative Literature Review as being the dominant theoretical framework and the most appropriate for the provision of nursing care in the context of Oncology (4) (5) (6).

We chose this case because it represents a profoundly serious health deviation situation and a concomitant compromised socio-family situation. The situation required activation of self-care agency and coping strategies due to a functional adaptation. It was a demanding case to manage, that required good preparation by the nurses who participated in the case management.

II. PURPOSE

This work aims to present a case study based on Orem's nursing theory.

Specific objectives: identify and systematize the most relevant nursing interventions to promote self-care and adaptation

of women to breast cancer disease; to establish a theoretical framework that supports the nursing care provided; thus contributing to the affirmation of Nursing as a practical human science, with its own body of knowledge, which gives it the degree of scientific discipline.

III. METHODOLOGY AND DATA COLLECTION

The authors consulted the patient's clinical process, in the *SClínico Hospitalar* IT system of ULSLA E.P.E., and operated a systematic review of the literature in various scientific databases through the website of the Order of Nurses (EBSCO, Cochrane) and on the website of the Portuguese Oncological Nursing Association.

IV. ETHICAL PROCEDURES

All the research was done ensuring the anonymity, respect and confidentiality of the data collected.

V. CLINICAL CASE

The case refers to a woman who was 36 years old at the time of diagnosis (2014) with Multifocal Invasive Ductal Carcinoma Her2 *like* type in the left breast. She underwent quadrantectomy with axillary dissection and adjuvant chemoradiotherapy in the first phase. By then her Eastern Cooperative Oncology Group (ECOG) Performance Status score was zero. The initial vascular access were peripheral veins in the forearm. The veins were fragile and totally implanted central venous catheter was placed.

Due to the relapse of the disease with brain, lung, liver, and bone metastasis, she underwent holocranial radiotherapy by brain metastasis and started to undergo palliative chemotherapy. At the time of the diagnosis, she was professionally active and married. She is the mother of two minor children that were 6 and 9 years old at the time and are 11 and 15 now. She went through a divorce process in the end of the adjuvant treatment and was not working. At the time of the relapse she was alone with the children.

During the adjuvant treatment, the woman had the expectation of healing. When the disease relapsed, she presented a great emotional and psychological distress related to her survival and the exercise of parenting. Her ECOG Performance Status score then was 2.

By now, this woman has 41 years old. The palliative treatment had a favorable outcome and she only has lung metastasis diagnosed. Her ECOG Performance Status score is 0 and she is working in a part-time schedule. She takes care of her children and does all the domestic chores.

VI. DOROTHEA OREM THEORY

Born in 1914 in the United States of America, Orem was a nursing theorist and created the Self-care Deficit Nursing Theory. Orem theory is known as Orem Model of Nursing and was developed between 1959 and 2001 (7).

Orem's theory comprises three main frameworks: Theory of Self-Care, Theory of Self-care -deficit and the Theory of Nursing Systems (8) (9) (10).

Dorothea Orem bases her conceptual model on the premise that integrated human functioning includes physical, psychological, interpersonal, and social aspects. She believes that what distinguishes human beings from other living beings is their potential for learning and development. Hence to point out the supportive-educative system as a method of nursing intervention assistance (11). Basically, she advocates that every person has learning and self-care potential and nurses act through compensatory systems supporting the self-care and learning deficits (3) (8). So, the aim of nursing profession is to attain independence in self-care (8). Patients are encouraged to take their own decisions through the development of a collaborative relations with nurses (3) (10).

Self-care is defined as a human regulatory function performed intentionally, with a view to acquiring the necessary conditions to ensure life, maintain physical and psychological functioning within parameters compatible with life, guaranteeing human integrity and development (3) (12).

The Self-Care Theory is presented as a process based on an operational structure. This structure consists in estimative, transitional and production operations. An operation means the knowledge and attendance of each existent self-care requisite. The estimative operations regard to the existing condition, in a time and place. The transitional operations refer to the judgment of the results achieved through execution of estimative operations. The production operations are acts that guarantee the necessary resources for the self and its environment, in order to allow the realization of care measures with the use of specific methods to meet each particular requirement of self-care (3).

The capacity to perform self-care is called self-care agency. Orem identifies three types of predisposing conditions to self-care agency:

Type 1 - foundational capabilities and dispositions.

Type 2 - capabilities to initiate and perform self-care at a given time and place.

Type 3 - capabilities to start and maintain estimative, transition and production operations over time. To create references from the operations performed to know, particularize and meet existent and projected self-care requisites.

These three types of allowing requirements constitute a model of structure of self-care agency (3).

Orem identifies requirements of universal, development and health deviation self-care. Universal requirements refer to structural or functional integrity; development requirements refer to life and maturation processes and health deviation requirements refer to the situation of a sick or injured person undergoing medical diagnosis or treatment (12).

Nurses work through compensation systems in the identified self-care deficits. The Self-care deficits occurs when self-care needs are larger than the person's ability to provide for them; refers to the limitations of individuals in achieving their self-care (8) (12).

The systems are the actions nurses perform and the relations they develop when they practice nursing (3) (9).

There are three levels of compensatory systems: wholly compensatory system, partly compensatory system, and supportive-educative system (8).

Nursing systems are implemented through aid methods. These help methods are: acting or doing for patients, guiding patients, supporting patients physically and psychologically, providing the environment that promotes personal development and teaching patients (8) (12) (9).

The supportive-educative system was identified as the one that best meets the needs of the cancer population undergoing chemotherapy treatment (4) (13) (14) (15).

The theory developed by Orem was validated by studies of Integrative Literature Review as being the dominant theoretical framework and most appropriate for the provision of nursing care in the context of Oncology (6) (4) (16).

Orem's conceptual model lacks the inclusion of the Spirituality dimension. This is a dimension particularly present in the mind of the person who is in a life-threatening situation. Spirituality gives us a sense of the meaning of life. In a situation in which survival is threatened, it is important that the person feels that her/his life has and had meaning, that it is important. Spirituality means knowing that life has meaning beyond the mundane existence of everyday life (17).

Even without regarding the questions related to spirituality, the theory developed by Orem is the one that best responds to deficits in development self-care requisites comprising the transitional aspect of adaptation and to health deviations, especially in an oncological scenario.

VII. RESULTS / FINDINGS

The implementation of the nursing process presumes the use of critical thinking. There are four structured cognitive operations that are required: diagnostic, prescriptive, regulatory and control (10). We will use the term "operation" as it is in the original theory, but this "operations" mean nursing interventions.

Diagnostic Operations: Basic conditioning factors related to housing, basic sanitation and economic resources were guaranteed.

The Universal Self-Care deficit requirements identified were induced by the disease and were adverse events caused by the treatments. So, they are also Health Deviation deficits requirements that demanded therapeutic Self-care. They are: inadequate effective respiration related with cough, inadequate eliminative process related with constipation, inadequate skin integrity related with Doxorubicine administration in a peripheral vein, body image modification related with alopecia, inadequate physical activity related with fatigue, inadequate psychological and emotional balance related with a life threatening disease and potential parenting disruption, and inadequate social interaction related with social isolation because of the fatigue.

No Developmental Self-Care requirements deficits were found. The woman revealed adequate Self-care Agency to deal with the initial diagnosis and with the transition between adjuvant and palliative treatment.

Prescriptive Operations: Self-care Agency was assessed by a semi-structured interview. We set with the patient what was the acceptable level of deviation for each condition.

We identified the supportive-educative system has the most appropriate for this situation.

Regulatory Operations:

Self-care Agency was developed and the adherence to treatment and management of adverse events were enhanced by the helping methods used. They were guiding and directing, teaching, providing psychological and emotional support and providing and maintaining environment that supports personal development. We also provide written information support with the management strategies of the adverse events.

Control Operations: This woman revealed decreased level of worry and anxiety. She is independent in all daily life activities and instrumental life activities.

She has a normal weight and low risk of malnutrition.

She cares of her central vascular access avoiding sudden movements and carry weights. Her central access is functional and well implanted.

She cares of her left upper limb doing the preventive lymphedema exercises. Does not present lymphedema signs.

She used facial make-up and wore a turban when her body image was altered. She referred sadness about her image, but she did not isolate herself.

Demonstrated adherence to the treatment and correct management of cough, pain, constipation, fatigue, and drowsiness with non-pharmacological, and pharmacological strategies.

Her speech and behavior are suggestive of functional adaptation as she accepts quality of life as a main goal.

VIII. DISCUSSION

The theory developed by Orem covers the needs of women with breast cancer in nursing care as well as the type of professional help to be provided (4) (12).

Nursing operations founded on this theoretical framework and based in a supportive-educative system, aim to help patients increase their self-care resources and encourage decision-making. This system allows for greater involvement in the process of adaptation and management of health problems (4).

Regarding the diagnostic operations, we consider that the Self-care Agency should be supported by a structured interview where the power components for performing estimative, transitional, and productive operations would be assessed. The better moment to make this assessment is before treatments initiation (14).

We also consider that before the first treatment and between the subsequent treatments a quality of life assessment should be applied (18). The quality of life assessment allows nurses to identify the impact of the disease and adverse events in life and the human responses to that. From here we can guide and direct management strategies that better suit this person.

Also, in the first contact, information should be given in order to prepare the person to what will probably happen (4). This previous knowledge allows the person to activate their internal Self-care power components to deal with the situation and gives the sensation of being in control. This emotional and psychological state predisposes the person to engage in the learning process (14).

The prescriptive and regulatory nursing operations proved themselves to be adequate. In the control operations we can observe the absence of complications and the adoption of health-promoting behaviors.

IX. CONCLUSION

The case presented reveals a path of functional adaptation to a very disruptive health deviation from the person's life. The woman underwent surgical treatment and adjuvant treatment with the expectation of cure. And then palliative treatment with the expectation of living with quality.

The strategies of adaptation to health deviations and management of adverse events used by the woman under the guidance and monitoring of the nursing team proved to be appropriate.

Nursing interventions were supportive-educative as recommended by the literature.

A host nursing consultation should be implemented. This consultation allows the identification of self-care resources and deficits using an appropriate instrument for this purpose, as well as the preparation for the treatment of chemotherapy and associated adverse events (4) (19) (20).

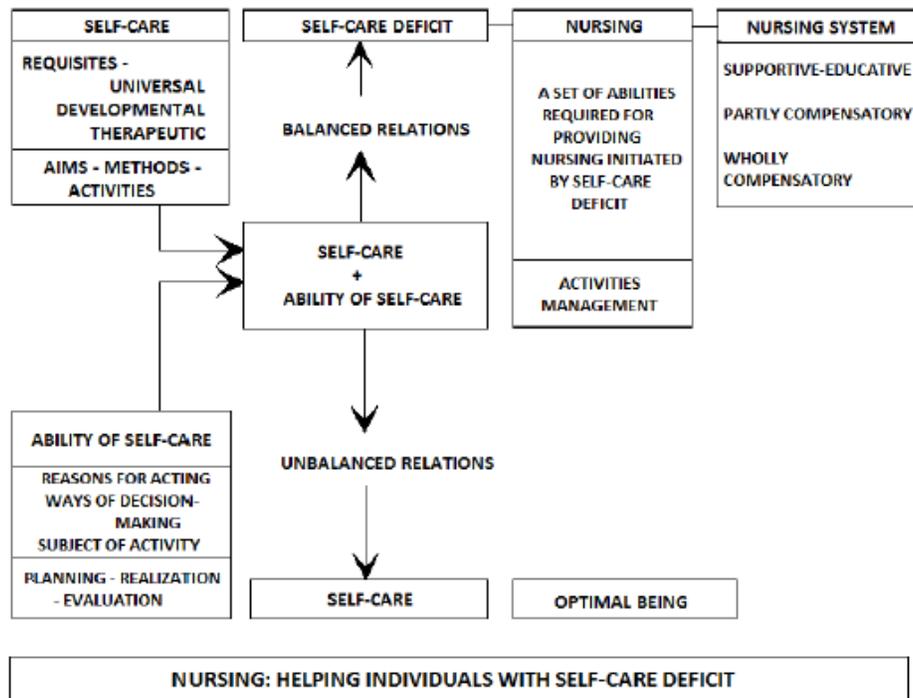


Figure 1. Model of self-care deficit. In: Jarosová, D. (2014). Supporting Material. Nursing Theories and Models. (8)

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Analgesic Properties of Crude Aqueous Extract of *Senna occidentalis* Leaves in Wistar Albino Rats by Tail Flick Method.

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DOI: 10.29322/IJSRP.10.09.2020.p10531

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10531>

Abstract- *Senna occidentalis* leaves were collected at Maiduguri Metropolitan Council (MMC) of Borno State, Nigeria and extracted in water by simple maceration method. The aqueous extract was tested for its analgesic activity in Wistar albino rats by tail flick method, where the result showed significant ($P < 0.01$) increase in reaction time from 6.60 ± 0.20 to 8.00 ± 0.32 compared with the control (5.00 ± 0.00) for the extract graded doses of 200 to 600 mg/kg, at 30 minutes post treatment; 7.20 ± 0.37 to 8.60 ± 0.24 compared with the control (4.60 ± 0.24) for the same graded doses of the extract, 60 minutes post treatment; 5.60 ± 0.24 to 7.60 ± 0.24 compared with the control (4.60 ± 0.24) for the same graded doses of the extract, 90 minutes post treatment; and 5.20 ± 0.20 to 6.40 ± 0.24 compared with the control (4.60 ± 0.24) for the same graded doses of the extract, 120 minutes. This study was carried out simultaneously with a standard drug (diclofenac 10mg/Kg) to compare the analgesic potency of *Senna occidentalis* crude extract, where 9.80 ± 0.20 , 11.40 ± 2.04 , 9.00 ± 0.32 and 8.60 ± 0.24 were recorded at 30, 60, 90 and 120 minutes respectively. The analgesic potency of *Senna occidentalis* leaves thus explains the successes seen when local people use it in treating different fever conditions. It was concluded that crude aqueous extract of *Senna occidentalis* has a good dose dependent analgesic activity in Wistar albino rats. It was recommended that use of *Senna occidentalis* leaves in the treatment of fever conditions should be encouraged, since the leaves are cheap, readily available and efficacious.

Index Terms- Analgesic activity, Aqueous extract, *Senna occidentalis*, tail flick met

I. INTRODUCTION

Plants are known globally as source of various types of drugs; this practice is common especially in traditional medicine (Bako *et al.*, 2005). Plants are prepared in various forms in order to derive their medicinal benefits such as crude extracts, decoction, infusion or tincture to treat common diseases (Odeja *et al.*, 2014).

Senna occidentalis (Linn.) (formerly *Cassia occidentalis*) is a weed of the *Leguminosae* family, and is common throughout the tropical and subtropical regions of the world (Ibrahim *et al.*, 2010). It is mostly found in open fields and in farms cultivated with other

crops such as groundnuts, soybean, sorghum, maize and others; thus, it is practically impossible to prevent this plant from mixing with the cultivated crops (Lar and Gupta, 1973; Barbosa-Ferreira *et al.*, 2005).

Senna occidentalis is highly valued for its medicinal usage to treat different conditions by the locals in northern Nigeria. Scientific reports revealed several pharmacological properties of this plant. These include antibacterial (Odeja *et al.*, 2014); antimalarial (Tona *et al.*, 1999; Chukwujekwu *et al.*, 2006); antitrypanosomal (Ibrahim *et al.*, 2010); anti-inflammatory (Taiwo *et al.*, 2013); hepatoprotective (Yadav *et al.*, 2009) and anti-hyperglycemic (Usha *et al.*, 2007) activities.

II. MATERIAL AND METHOD

Extraction of Plant Material

The leaves were first air-dried under shade and ground into powder using clean wooden pestle and mortar. Maceration method was used for the extraction. One hundred grams (100 g) of the powdered sample was blended with 2.5 litres of distilled water in a 5 litre round bottom flask for 48 hours with agitation, at room temperature. The mixture was decanted and the solution filtered using Whatman filter paper No. 1. Some fresh distilled water was added to the residue and allowed to stand for 24 hours, decanted and filtered. The solutions were combined and transferred into an open tray, and dried in an oven at 40°C, for 24 hours.

Experimental Animals

A total of Twenty (20) Adult Wistar albino rats of both sexes weighing between 105 - 158 g were used for the study. The animals were randomly divided into five (5) groups of four (4) rats per group. Rats were handled according to global best practices and were kept for two weeks for acclimatization to be achieved.

Procedure for Testing Analgesic Activity by tail flick (Tail Immersion Method)

The tail immersion method was used to evaluate the analgesic activity. In this method, pain reactions in animals were produced by thermal stimulus by dipping the tip of the tail in hot water (Upudha *et al.*, 2007). The rats were divided into five (5) groups of four (4) animals each. Feed was withdrawn for 16 hours but water allowed *ad libitum*. Group 1 served as control and were

administered 1ml of distilled water orally. Group 2–4 were administered 200, 400 and 600 mg/kg of the extract, respectively. Group 5 served as reference control and were administered Diclofenac (10 mg/kg) orally. Before administration of the extract and the reference drug, the basal reaction time was measured. After administration of the extract and the drug, reaction times were measured at 30, 60, 90 and 120 minutes by immersing the tail tips of the rats (last 1-2 cm) in hot water heated at temperature of $55 \pm 1^\circ\text{C}$. The actual flick responses of rats, that is, time taken

in seconds, to withdraw tail from hot water source was calculated and results were compared with control group.

Data Analyses

The results were analysed using GraphPad InStat Version 3.05, 2000 and presented as means \pm standard error of the mean (SEM). Differences between means were assessed using Analysis of variance (ANOVA) and post-test using Dunnett comparison test (Mead and Curnow, 1982). The $p < 0.01$ or $p < 0.05$

III. RESULTS

Table 1. The analgesic activity of crude aqueous extract of *Senna occidentalis* leaves in Wistar Albino rats by tail flick method

Group	Treatment	Dose (mg/kg)	Reaction time in seconds at 30 min.		Reaction time in seconds at 60 min.		Reaction time in seconds at 90 min.		Reaction time in seconds at 120 min.	
			(mean \pm SEM)	(mean \pm SEM)	(mean \pm SEM)	(mean \pm SEM)	(mean \pm SEM)	(mean \pm SEM)		
Control	Water		5.00 \pm 0.00	4.60 \pm 0.24	4.60 \pm 0.24	4.60 \pm 0.24	4.60 \pm 0.24	4.60 \pm 0.24	4.60 \pm 0.24	4.60 \pm 0.24
Test – 1	Extract	200	6.60 \pm 0.24**	7.20 \pm 0.37**	5.60 \pm 0.24*	5.20 \pm 0.20	5.60 \pm 0.24*	5.20 \pm 0.20	5.60 \pm 0.24*	5.20 \pm 0.20
Test – 2	Extract	400	7.60 \pm 0.24**	8.40 \pm 0.24**	7.20 \pm 0.20**	6.20 \pm 0.20**	7.20 \pm 0.20**	6.20 \pm 0.20**	7.20 \pm 0.20**	6.20 \pm 0.20**
Test – 3	Extract	600	8.00 \pm 0.32**	8.60 \pm 0.24**	7.60 \pm 0.24**	6.40 \pm 0.24**	7.60 \pm 0.24**	6.40 \pm 0.24**	7.60 \pm 0.24**	6.40 \pm 0.24**
Standard	Diclofenac	10	9.80 \pm 0.20**	11.40 \pm 0.24**	9.00 \pm 0.32**	8.60 \pm 0.24**	9.00 \pm 0.32**	8.60 \pm 0.24**	9.00 \pm 0.32**	8.60 \pm 0.24**

* = Significantly different from the control at $p < 0.05$ along the same column
** = Significantly different from the control at $p < 0.01$ along the same column

The result of analgesic activity of *Senna occidentalis* leaves in Wistar Albino rats by tail flick method is presented in Table 1. The result showed significant increase in reaction time from 6.60 \pm 0.24 to 8.00 \pm 0.32 compared with the control (5.00 \pm 0.00) for the graded dose of the extract (200 to 600 mg/kg), 30 minutes post extract administration; 7.20 \pm 0.37 to 8.60 \pm 0.24 compared with the control (4.60 \pm 0.24) for the same graded dose of the extract, 60 minutes post extract administration; 5.60 \pm 0.24 to 7.60 \pm 0.24 compared with the control (4.60 \pm 0.24) for the same graded dose of the extract, 90 minutes post extract administration; and 5.20 \pm 0.20 to 6.40 \pm 0.24 compared with the control (4.60 \pm 0.24) for the same graded dose of the extract, 120 minutes post extract administration.

60 minutes to 120 minutes following administration of the extract in all the doses used, including the standard drug (diclofenac). The gradual decrease in pain thresholds as the time increased following the extract administration could be due to the effects of drug metabolizing enzymes on the extract and the standard drug. The result of the study thus showed *Senna occidentalis* leaves is a potent analgesic source when compared with the increase in pain thresholds of the graded doses of the extract with the pain threshold of the standard drug (Diclofenac 10mg/kg) at different times following the extract administration. The analgesic potency of *Senna occidentalis* leaves also explained the successes seen when local people use *Senna occidentalis* leaves to treat different feverish conditions.

IV. DISCUSSION

Senna occidentalis plant is highly reputed by the local people of Northern Nigeria for the treatment of feverish conditions with magical successes. The result of analgesic activity study of *S. occidentalis* by tail flick method showed significant ($p < 0.01$) increase in pain threshold compared with the control. This finding agrees with the reports of Reeta and Ravindra (2013), Taiwo et al. (2013), and Odeja et al. (2014) on the analgesic activity of *Senna occidentalis*. The crude aqueous extract of *S. occidentalis* leaves showed dose dependent activity compared with the control where the effect increased to maximum at 60 minutes post the extract administration, and gradually decreased as the time increased from

V. CONCLUSION

It was concluded that crude aqueous extract of *Senna occidentalis* has a good dose dependent analgesic activity in Wistar Albino rats.

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Characterized of financial reporting quality of Libyan companies

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DOI: 10.29322/IJSRP.10.09.2020.p10532
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10532>

Abstract- Beside structural problems, Libyan economy is characterized by growth and disintegration of the national market, insufficiently active investment market, poor investment climate and the problems related to Microeconomics (lower productivity and efficiency of doing business). Taking into account all these problems, this research will be based on the study of the problems of the current system of financial reporting. Practice has shown that when it comes to the level of the national economy and administration, there is a low level of qualifications in the field of application of International Financial Reporting Standards (IFRS) and International Accounting Standards (IAS) for their non-compliance with existing standards of accounting and auditing in Libya.

Index Terms- Libyan, Microeconomics. Investment. Financial. Standards.

I. INTRODUCTION

The Libyan economy is unique in North Africa. While Algeria, Egypt, Morocco and Tunisia have a large population, a significant agricultural potential and well established industrial base, Libya possesses only some of these benefits, but primarily an attractive type of crude oil with a low sulfur content, as well as natural gas. Given the small number of inhabitants in the country, in proportion to the surface, as well as the substantial income from oil, the Libyan economy has more in common with the Persian Gulf countries rather than with our neighbors from the north of Africa.

After the discovery of oil, Libya has become a classic example of dual economy, where there are two separate economies (oil and non-oil). The World Bank defines Libya's economy as an economy with upper middle income, along with seven other African countries in the early 1980s, Libya was one of the richest countries in the world, and its GDP per capita was higher than in countries such as Italy, Singapore, South Korea, Spain and New Zealand.

Despite large investments in agriculture and non-oil sector which is related to the industry, the gross domestic product of Libya (GDP) mainly derived from petroleum and is fairly constant since the early 1970s, and varies between 50 and 60% up to in 1982. when oil revenues decline.

Agriculture provides the raw material for many industrial sectors in the country, exports and trade, and employs more than 70% of the workforce. The contribution of agriculture to GDP is around 30%, and most depend on climatic conditions. For the most part, agricultural resources are limited to two relatively narrow

strip along the Mediterranean Sea and several desert oasis. Lack of water is a major lack of expansion of arable land and irrigation, soil improvement, irrigation and introduction of modern agricultural techniques.

Due to the lack of coal and hydro power plants, the country has little energy potential. It can be said that Libya has practically no industry. The lack of a sufficient number of skilled labor still represents a problem. The rapid population growth, as well as the agricultural economy as a result they had a surplus of unskilled workers in urban centers. Since 2003, the government began to consider plans to diversify the economy from dependence on oil. Tourism is one of the sectors of the economy that has the perspective of development, so it is encouraged by the establishment of commercial banks to finance tourist projects. That same year, the government started to encourage investment projects, such as projects for the construction of roads, ports and communications, as well as industrial projects in manufacturing. Libya then launched an investment plan worth \$ 35 billion for the period up to 2005. The conflict which followed the revolution had a strong impact on the economy. Production of oil and oil products business in 2011 was quickly established.

II. BANKING IN LIBYA

After World War II Libya become a member of the British sterling bloc when declared independence in 1951. Shortly after created a national currency Libyan pound nominal value of US \$ 2.80. Currency remained tied to the pound sterling until November 1967. In the period after the nationalization of the assets of the Libyan British Petroleum in Libya, the British Government has expelled Libya from the sterling bloc. Then libijsksa currency changed from Libyan pound Libyan dinar (LD), divided into 1,000 dirhams, without changing the nominal value.

In December 1971, Libya has maintained the existing parity of the currency with gold, a consequence was that the value of the Libyan dinar against the dollar increased from US \$ 2.80 to US \$ 3.04 until 1974. In accordance with the law from 1955 (which was amended in 1958 godione), established by the National Bank of Libya in 1956 that begins to perform some of the functions of the central bank under the auspices of the Ministry of Finance. At that time, the commercial banks were mainly branches of large international banking institutions, and were engaged in providing short-term international and domestic commercial loans. Since 1963, the Central Bank of Libya was replaced by the National Bank of Libya, and she got exclusive right to issue currency and became responsible for maintaining monetary stability and the value of Libyan currency, and to regulate the movement of

currency and credit. Commercial banks were obliged to keep liquidity ratios and reserves with the Central Bank.

By 1970, the Central Bank has pursued a commercial operation, but then based National Commercial Bank which took over the commercial responsibility of the Central Bank. The military government that took power in 1969 thought that the banking sector is the primary object of the general program "Libijalizacije". In November 1969, the new government all banks in the country under control. In July 1970, the government had a 100% - nu control over four large banks with foreign ownership. In addition to National Commercial Bank was founded in 1987) Bank of Libya, which had about thirty branches throughout the country. Then they began to work and other commercial banks as Sahara Bank, formerly Banco di Sicilia and Umma Bank, the successor of Banco di Roma. Wahda Bank was formed in 1970 through the merger of five banks. In addition to commercial banks in state ownership, Libya established the National poljoprivredneu Bank and the Industrial Bank and the Bank for Real Estate Libya Lafica and LAFB.

Agricultural Bank is a specialized institution established in 1957. It was supposed to provide interest free loans to farmers. Agricultural Bank was buying products from farmers, guaranteeing them a profit and sold them to citizens at subsidized prices. The Bank has had good results; In the past, 90 percent of all loans have been returned. Industrial Bank of Libya was a development bank which gave industrial loans. In early 1972, the government established LAFB as a branch of the Central Bank's wholly-owned, but she did not follow the law of the Central Bank, and dealt with the financial and banking operations outside the country and has worked as a foreign agent of the Libyan government and commercial banks. The main objective was to encourage the establishment of regional development, especially in countries friendly to Libya. Until 1985, the bank has established LAFB world's largest chain of eighteen branches and achieved total assets of US \$ 2.9 billion.

III. ACCOUNTING DISCIPLINE IN LIBYA

Accounting is a discipline, which generalizes the one hand practical accounting industry from all aspects, on the other hand is improving. The science of studying accounting methods and techniques of assessment (evaluation, measurement), billing, accounting for transactions and recognition of balance sheet items and their presentation and disclosures in the financial statements. As a scientific discipline of accounting is to a greater or lesser extent occurs as a subject in almost all university institutions and schools, particularly where educated personnel economics profession.

Financial accounting is directed mainly towards satisfying the interests of external users of accounting, that is, to preparing and presenting general purpose financial statements. These financial statements are strictly formal and with certain legal entities subject to audit in accordance with the laws governing the obligations of the audit of financial statements. These are the regular annual and in some cases extraordinary financial statements submitted to state authorities, financial market institutions, shareholders, investors Financial Accounting monitors external business area with scaled aggregate data on the internal area of business. It includes the accounting of assets and

liabilities according to sources of funding and operating results of the overall business process in the unit of accounting, with special emphasis on financial relations with others.

As a result of globalization, many developing countries have adopted the accounting system of the western, developed countries, to take advantage of the ability of these systems to generate the information necessary for the effective national economic planning. The most commonly adopted accounting systems the US and Britain, and the factors identified in this process include the British Empire, the English language, the availability of professional qualifications offered by some of the UK professional accountancy bodies in the overseas countries and educational exchanges and direct aid from the US and Great Britain.

Despite these differences between Libya, as well as emerging economies, and the United Kingdom and the United States, as well as developed countries, Libya has adopted their accounting systems. It is meant to be largely guided by accounting principles, auditing standards, accounting and the accounting profession institutions that Libya and applied without careful consideration of local impacts. This practice is problematic because it is known that in the transitional economies, its implementation in a proper way is not possible or not advisable, without understanding the unique political, economic, social and religious dynamics of these economies.

The accounting profession was first established in Libya in the early 1950s. Accounting has become popular in 1957, when he founded the Faculty of Economics and Commerce at the University of Libya. Professional bodies and universities from the UK and the US were the main source of influence, providing education and training for Libyan students. Many Libyan students have completed their studies at American universities in the 1970s, as the US economic strength and a leader in accounting practice and education, as well as the fact that Libya has probably had good relations with the United States. Compared with Western accounting profession, which has existed for more than a century, the Libyan Association of Accountants and Auditors (Laaa) is quite young, was founded in 1973, only 37 years since the CAN system "Chartered Accountants" introduced by Law no. From 116 in 1973.

Although the LAAA established more than three decades, she has done nothing to build any professional theoretical basic principles and practices of accounting as a profession in Libya nor established a Code of Ethics for members. Instead, she simply followed the government's regulatory requirements pertaining to the accounting practices. This suggests that Laaa failed to recognize their commitment to the public interest. Besides, he did not achieve the goal of improvement activities such as studies, conferences, seminars, education and training program or promotion accounting practices to improve the status of the profession and members of the association. All these factors contribute to the current very poor state of Libyan accounting profession.

LAAA was founded in 1973, and its objectives, rules and regulations are codified in the Law of Accountants from 1973, which created the Public Accountants to monitor the public accounting profession. The Management Board of LAAA is responsible for:

- registration of public accountants

- keeping records of public accountants,
- determine the qualifications of persons for public accountants registration,
- ensuring compliance with ethical codes of conduct and disciplinary issues.

From two possible approaches for regulation of accounting profession, professional self-regulation and statutory controls, Libya adopted legal control, so that the accounting profession regulated Libyan commercial and financial laws. Theoretically, Laaa is responsible for establishing and monitoring of accounting standards and practices (Law on Accountancy Profession no. 116 of 1973) in Libya, but in practice Laaa failed to adopt and implement the Libyan accounting standards. Weakness Accountants in Libya has led to the fact that the state was the only one that regulates powers.

IV. STANDARDS OF INTERNATIONAL FINANCIAL REPORTING

International Financial Reporting Standards (IFRS) represent a unique set of high quality global accounting standards that are the basis for the preparation of transparent and uporedivnih accounting information presented in the form of basic financial statements.

Globally recognized basis for financial reporting has the following advantages:

1. raise consumer confidence in quality of financial statements drawn up,
2. application of standards assured by transparent and globally comparable financial reports,
3. raising the quality of financial reporting facilitates access to sources of capital to small and medium-sized entities,
4. from the standpoint of compiler, the application of these standards ensures the existence of a balanced relationship between the costs and benefits of the presented financial statements,
5. acceptance of IFRS for the SME (small and medium entities) as a basis for financial reporting for small and medium-sized entity ceases to be a need for the adoption and maintenance of a permanent national accounting standards.

IFRS Foundation is an independent, non-profit private organization that works in the public interest. Its main objectives are:

- to develop a single set of high quality, comprehensive, globally accepted international financial reporting standards (IFRS) with the help of his body for setting standards, IASB,
- to promote the use and correct application of these standards,
- to take into account the needs of financial reporting in the economies of developing countries and small and medium size (SME)
- to carry out the convergence of national accounting standards to IFRS with high quality solutions.

IFRS are used in many parts of the world, including the European Union, Hong Kong, Australia, Malaysia, Pakistan, the countries of the Arabian Gulf, Russia, South Africa, Singapore and Turkey. From 27 August 2008, more than 100 countries worldwide, including all of Europe, currently require or permit IFRS reporting. About 85 of those countries require IFRS reporting for all domestic, listed companies. In addition, the United States is directed towards IFRS. US slowly, gradually shifting requirements only in GAAP order to accept IFRS, and will likely take a long-term US and MFRS standards. On 6 September 2007, the IASB issued a revised IAS 1, Presentation of Financial Statements.

Components of comprehensive income may not be presented in the statement of changes in equity. The financial position of the company is primarily provided in the Statement of Financial Position, which contains the Statement of financial position, statement of comprehensive income, or two separate reports containing income statement and separate Statement of comprehensive income, which represents the gain or loss in profit or loss and total comprehensive income and then report on capital changes (SOCE), cash flow statement or statement of cash flows, notes, including a summary of significant accounting policies.

The realization of the objectives of financial reporting involves respecting certain requirements, usually indicated as generally accepted accounting principles, or principles. In essence represent the accounting principles of the Convention, the implementation of which should ensure that the generation of reliable, understandable and comparable financial statements, as well as in terms of providing comprehensive information base for decision making. In a variety of principles governing the formal or substantive content of financial statements, in terms of correct and fair presentation of the financial position and yield power companies, the accounting standards particularly stand out:

- the principle of consistency - consistency (consistency concept)- which advocates that a selected valuation rules applied consistently from period to period,
- the principle of prudence (prudence concept)- stems from the principle of the protection of creditors and preventing weight overstatement of net assets of the company,
- the principle of imparity- account must be taken all possible liabilities and potential losses,
- the principle of accrual (accruals concept)- transactions are accounted for at the moment of creation, in which priority is given to the moment the income and expenses associated with the income for which they are incurred,
- principle of individual assessment- the components of assets and liabilities to be assessed separately (separately),
- the principle of identity-opening balance of each financial year must correspond to the closing balance of the previous year.

Elements of financial statements include:

- property; asset is a resource controlled by the enterprise as a result of past events from which future economic benefits are expected in the company,

- responsibility; present obligation of the enterprise that based on past events, one of which is expected to lead to an outflow of resources, ie. funds from companies,
- Capital: to the rest of the assets of an enterprise after deducting all obligations under the historical cost accounting model. The capital is also known as a founding stake.

The elements of the income statement or the elements that measure the financial performance are as follows:

- income; increases in economic benefits during the accounting period in the form of inflows or enhancements of assets or reduction of liabilities that result in increases in equity. However, this does not include contributions from equity participants, ie, owners, partners and shareholders.
- expenses; decline in economic benefits during the accounting period in the form of outflows or reduction in the value of foreign currency assets or liabilities that result in a reduction of capital.

Revenues and expenses are measured in nominal monetary units according to the historical cost accounting model and in units of constant purchasing power (adjusted for inflation), according to the model units of constant purchasing power.

V. ELEMENTS OF FINANCIAL STATEMENTS

The item is recognized in the financial statements when:

- It is probable future economic benefit flowing from the entity or in entity
- the resource can be reliably measured.

Measurement is the process of determining the monetary amounts, which are the elements of financial statements recognized in the balance sheet and income statement. This includes the selection of a certain measurement.

The qualitative characteristics of financial statements according to IFRS for the MSE are: understandability, relevance, materiality, reliability, substance over form, prudence, completeness, comparability, timeliness, balance between benefits and cost. All qualitative characteristics are given equal footing and with the same character. Intelligibility is an essential quality of the information in the financial statements that enables users to understand its meaning. Since the financial statements are required to be drawn up so that users can immediately understand the information they contain. Understanding of the information provided by the selection and labeling them expressed the accounting category.

Relevance - ability of information that allows the adoption of appropriate decisions. In other words, under the relevant financial information is considered to be one of information that is appropriate to meet the needs of users in content, scope, time and method of preparation.

Materiality is such a characteristic of accounting information, where to its omission or misstatement expression

could influence the economic decisions of users taken on the basis of such financial statements. Materiality depends on the size of the item or error assessed in the particular circumstances of its omission or wrong formulation. Reliable information when it is in it has no material errors or bias when faithfully represents the business transactions or which might reasonably be expected that it represents.

Prudence is the inclusion of a certain degree of caution in the judgment necessary for the assessment required by the conditions of uncertainty, such that assets or income are not overstated and liabilities or expenses are not understated. However, the use of prudence does not allow the deliberate understatement of assets or income, or the deliberate overstatement of liabilities or expenses. Comparability is a characteristic of such accounting information that enables you to compare the financial statements of an entity in order to identify trends in terms of its financial position and operating performance. At the same time, customers must be able to compare the financial statements of different Entities to evaluate their relative financial position, performance and cash flows.

Planning is the primary step for any international company before investing in another country or region in the world. One of the steps of this planning is the study of the accounting system in the country where the company is interested in investing.

VI. CONCLUSION

In order to achieve development in Libya is required to satisfy the interests of foreign investors with a set of financial reporting standards that apply in countries where investors are encouraged, and these are mainly countries that use MFRS, because it will reduce confusion and mistakes and fraud, which will lead to increased confidence in the management of Libyan companies. This transparency and confidence can lead to better corporate governance in Libya that can not be underestimated by investors. It has the advantage of Libya to follow IFRS rather than establishing its own set of financial reporting standards, however, although there are concerns in the country.

Accounting and auditing standards adopted by Islamic financial institutions are clearly a reflection of the various laws of financial instruments, contracts, insurance and interest, ethical standards, and the types of business organizations that use them. These standards are slightly different from those established by the IASB. In particular, they differ primarily in the number of questions relating to the lease, limited term contracts, investment accounts (because the investors bear part of the business risk). The representative of the IASB will solve a lot of problems, because he will understand these differences and common sources of finance, accounting regulations and frameworks, the level of industrial development, as well as many other factors that are relevant, according to his experience.

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The Effects of Profit Margins on Dividend Payout in Kericho Tea Estates

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DOI: 10.29322/IJSRP.10.09.2020.p10533

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10533>

Abstract:

Tea sector is a major source of revenue to the Kenyan government. The study established the effect of production index on dividend payout policy on firms. The general objective analyzes the effect of profit margin on dividend payout in Kericho tea estates. A descriptive research design approach was used and the target population comprised of all the 105 respondents for a target population of 300 in selected tea factories in the county. The questionnaire was personally administered and the validity of the study was ensured through critical review by the research supervisor. The analysis was performed using data derived from the financial statements of listed factories under KTDA during the most recent period. Ordinary Least Squares model was used to estimate the regression equation. The data was analyzed using regression with the help of statistical package for social sciences (S.P.S.S) computer software program version 21 and presented using a pie chart and tables. Permission was obtained from the management of the institution before questioning and interviewing occurred.

Keywords: Dividend payout, Profit margins, firm performance, return to equity ratio

Introduction

The issue of dividend policy has become a great concern in the current business environment. According to Nhlapho (2018), dividend policy refers to the regulations and guidelines that any firm uses to pay their shareholders. Further the author pointed that dividend policy actually guides the company's decisions in all the corporate policy. Dividends pay-out, which refers to the benefits that the shareholder receives for risking their investment, is determined differently depending on the company. Some Factors such as financing limitations, size of the firm, pressure from the shareholders, investment chances available and regulatory policies constrain firm decision making in its dividend pay-out. Jayasinghe, (2019) noted that, dividend pay-out is not only a source that a firm can pay its stakeholders, but also through the dividend pay-out, stakeholders can get information concerning the firm performance currently and the expected performance in future. According to Singla and Samanta (2019), firms design its policy payout to communicate its earnings and investment to the current shareholders as well as the prospects.

According to Yahaya (2019), every firm are entitled with an objective, to enhance shareholder's wealth and profits. An enhanced shareholder's wealth will imply increase in growth and sales in the company and thus more profits. The overall implication is better firm performance, which is seen as how well the organization can enhance its shareholders' wealth to generate more investment. Dividend payout has an effect on the value of a company and thus an effect of shareholder's wealth. This means then that, dividend payout policy and decisions require serious management attention. According to Haque et al., (2013), dividend policy remains a crucial financial policy not only from the view of the company but also to the shareholder, consumer, government and consumers.

From the company point of view, dividend payout policy is pivotal to all other financial policies since it dictates fund that will flow out of the organization and what the firm needs to retain for reinvestment. Besides, it is the dividend payout policy that will determine how the firm will perform in future and influence of cost on earnings.

According to Gugler and Yurtoglu (2003), dividend payout is a puzzle, it determines share value as well its policy. Further, Yusra et al., (2019), noted the need for a company to pay its shareholders if they cannot determine a suitable investment that would give a higher turnover more than the stakeholders expectations. Different researchers pointed out different opinions on how dividend payout affect the prices of its share in the long run. According to research by Jabbouri and Attar (2018), dividend policy is used by corporate managers to enhance its market value. However, he pointed that the casual relationship that exist between profits and dividend on the short-run misleads investors. The author however did not explain the dividends power to explain much about the company's future earnings. Since profits are the surplus after deduction of all cost of production including any interest and taxation, profits are said to measure the company's success. When considering investments and financing decisions, any finance manager will bring dividends payout policy and profits into play.

In Kenya, the tea estates have continuously restricted its dividend strategies to establish an effective policy that will meet the needs of its stakeholders. These tea estates although it has established dividend policies, researchers point to the difficulty in establishing the effect of profit margins on dividend payout since profits of tea estates are not only affected by micro-economic factors but also macro-economic factors such as prevailing levels of rainfall. The changing levels of profits means changing levels in earnings in the firm pausing danger in dividend payout stability in the estates. With poor weather conditions, tea production decline resulting to lower profits in the given season (Singla and Samanta, 2019). The profit proportion for the period is measured from the payout ratio determined as the cash dividend per profit share. It is from this point that the study hypothesized the linear relationship between profit margins and dividend payout.

Statement of the Problem

Despite many studies being done on dividends policy and its effects on profit margins, the relationship between profit margin and dividend payout remains unsolved in the corporate finance. Dividend is considered one of the sensitive issues in the corporate finance yet cash dividend policy behavior remains unanalyzed in many developing countries including Kenya. Kenya's economy depends on its exported cash crops with tea being a major cash crop, and although profits from tea production in the country have been noted to rise in the recent years, tea estates still find it difficult to pay out dividend to its shareholders with managers opting not to pay their shareholders for the purpose of expansion. Dividend policy in Kenyan tea estates thus remains sounded by an unresolved conflict. While investors invest to make a profit, the firms are interested with more profits. Earlier studies points that where firms are commitment to pay dividend enhances shareholder value as this will provide a positive signal to investors and thus more investments (Koduk, 2016). In the developed economies various researches have been conducted regarding the dividend payout policy and profit margin and some of the findings have been replicated in emerging economies or infant capital markets. Few studies are evident in Kenya in the banking sector and other corporate firms, can these studies be replicated to the Kenyan tea estates?

The Signaling Theory

According to the signaling theory there should be asymmetry information between a firm's management and its shareholders. Further, the theory pointed that dividends is a tool that can signal private information about the company performance to the outsiders (Connelly et al., 2011; BliegeBird et al., 2005; Sosis and Bressler, 2003; Karasek III and Bryant, 2012). Stakeholders not only receive dividends as a benefit for their risk investment but also gives them the signal concerning the future company investments, payout

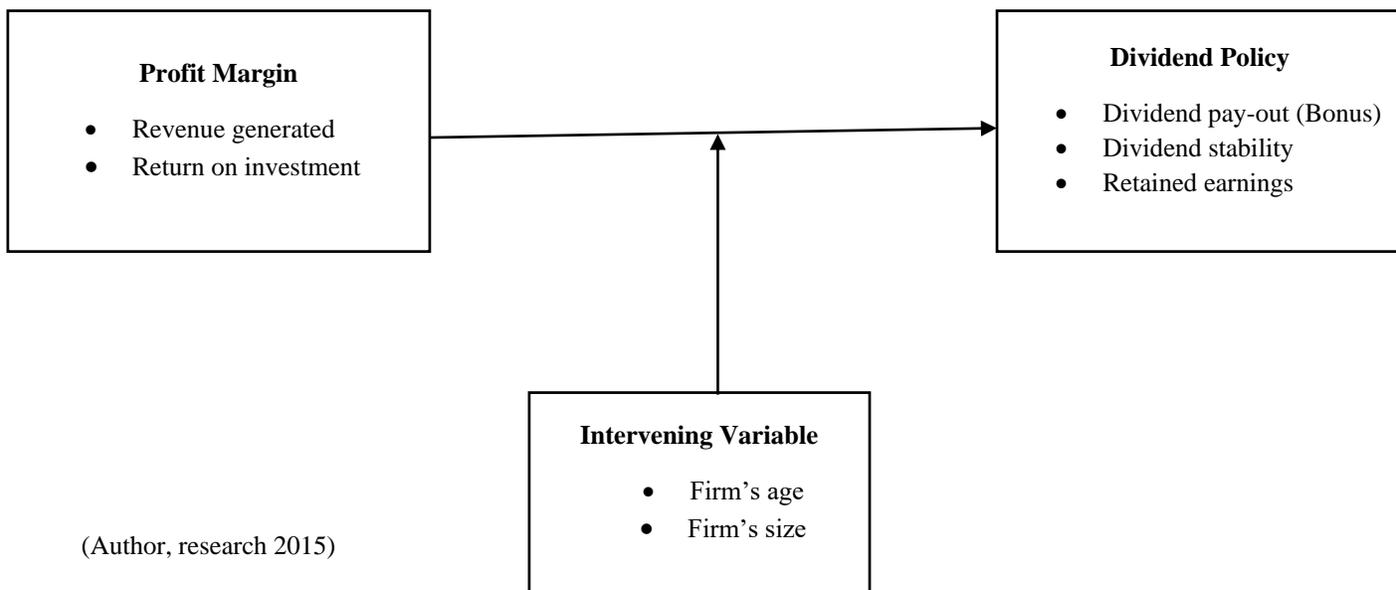
policy and stability of the company. The theory suggests some assumption, first, it is assumed that financial managers always hold some information and all the incentives to release the information to the stakeholders. Secondly, it is assumed that the information sends out is true, meaning that a company cannot pay higher dividends with a prediction of decrease of earnings in future. With the conditions existing in full, the market fluctuations correlates positively to these announcements (Palmrose et al., 2004). Therefore, the manager may be reluctant to act based on improved productivity of the firm.

Conceptual Framework

The conceptual model shows the relationship between the production index and dividend payout how each affects the other. The moderating variable tries to link both the independent and dependent variables.

Independent Variable

Dependent Variable



Research Design

The research adopted descriptive research design to obtain the evidence to test the theory, to evaluate a program, or to accurately describe a phenomenon as it is more flexible to consider the various aspects of the research problem. According to Amaratunga et al., (2002), descriptive research design is appropriate where there is an explanation of opinions and events of phenomenon under investigation. Whetten (2009) further noted that descriptive design identifies the features of the phenomenon through observation and correlation examination between two or more variables under investigation.

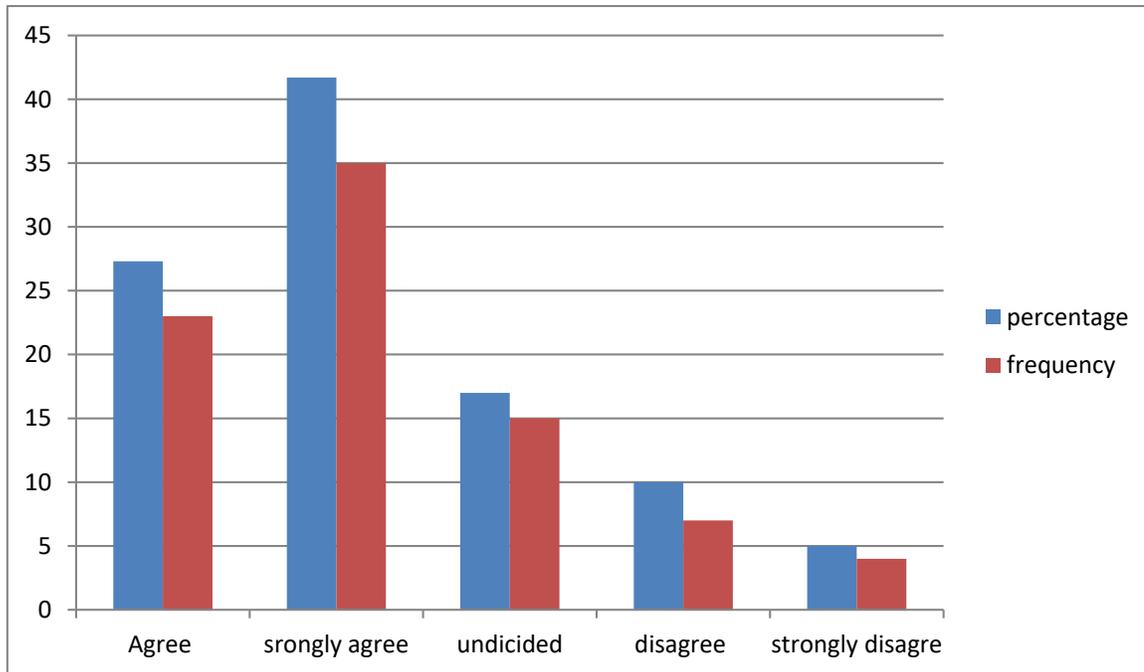
Validity and Reliability of Instruments

Naibei (2015) pointed that instruments should be evaluated on the extend to which it can measure and provide the data desired for the study. To validate the research instruments validity, the researcher sought the experts' opinion while constructing the research questioner. Fore reliability, a pilot study was performed which consistent with Cronbach's alpha coefficient and a figure of 0.801>0.7 which was adequate (Mugenda and Mugenda, 2003).

Result and Discussion

The study employed descriptive to analyze the study findings.

Response on effects of profit margins on dividend payout



Source: field data (2015)

The study sought to establish the effects of profit margin on dividend payout. It was established that 27.3% of the shareholders agree, 41.7% strongly agree. In addition, 17% were undecided, 10% reported a disagreement and 5% strongly disagreed on the impact of profit margin on dividend payout as y in fig 4.12 above. This confirms Wang and Gun (1993) argument that dividend payout ratio is positively related to profits

Descriptive Statistics

This is the analysis of the combined data from all the firms. The first step of analysis of a multivariate analysis data is a table of mean and standard deviation.

	N	Minimum	Maximum	Mean	Standard deviation
Profitability	7	0.0	22.87	8.1553	8.01899
Dividend		0.0	2.50	0.5604	0.70541

Source: field data (2015)

From fig4.4 the dependent variable, dividend payout has a minimum value of 0.00 and the maximum value of 2.50 with standard deviation of 0.70541. The minimum value for profitability is 0.00 with a maximum of 22.87 and standard deviation of 8.01899.

Regression Results

Regression Coefficients and their Significance

Regression coefficients		Prob.
Constant	-8.476	.000
Profitability X1	0.960*	0.041

Source: field data (2015)

The table indicates a positive regression coefficient on a 5% significance level. This implication is that profit margins influence dividend payout positively. These findings are consistent with research results by Botoc and Pirtea (2014), Mitton (2004), Grullon et al., (2005), Nissim and Ziv (2001) and Thafani and Abdullah (2014)

Conclusions

Since the profit margin indicates a positive regression coefficient at a 5% significant level, stable business is more likely to pay higher dividends compared to firms with variable profits. earnings will payout a higher proportion of its earnings as dividends than firms with variable earnings. The study uses shareholders return to equity to represent the company's profit margin. From the study, there is a positive correlation between profit margin and the dividend payout shareholder's equity.

Recommendations

From the results and analysis, the profit margin has positive and significant effects on dividend payout, From the findings, the study recommends that, the Kenya Tea Development Authority (KTDA) support the tea estate to be more profitable so that farmers get high dividend. There is need for the government to waive the huge debts in societies owned by the tea farmers. Further, there is need to subsidize fertilizer for the farmers to afford and in turn will cut production costs in the tea estate thus more profits.

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Sustainable City Development is Possible? A Review of Challenges and Key Practices towards Urban Development in Developing Countries

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DOI: 10.29322/IJSRP.10.09.2020.p10534
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10534>

Abstract- Presently, half of the world population live in cities and the world is rapidly urbanizing keeping the cities as the major living space of the people. It has been projected that by the year 2030 urban population in the world will increase up to 60 percent. This rapid increase in urban population will make a huge demand for their socio-economic needs and will exert much pressure on natural resources. Therefore, understanding the issues which can arise in immediate future today's world is working toward the sustainable development, conceptually which is meeting of present as well as future needs of humanity without damaging the natural environment. In this context, how cities can be managed to contribute to this overall achievement as they are engines of economic growth and development and major contributors to numerous environmental problems on the other, should be largely discussed. In this context, this article discusses challenges and key sustainable practices to be considered in building of sustainable cities especially in developing regions based on the secondary sources issued by international organizations such as United Nations, World Health Organization, World Bank and research done by scholars.

According to the current trend and projections, much of urban growth in future will happen in developing countries especially in Africa and Asia, bringing huge social, economic and environmental transformations and face numerous socio-economic, environmental and institutional challenges on the way to the sustainable cities. Uncontrollable rural-urban migration, absence of efficient and environmentally-friendly transportation, waste and water management systems, negative impacts of climate change, weak institutional set up and deficiency of finance for investment can be identified as major challenges faced by developing countries. Promoting rural development, shifting to renewable energy sources for both transportation and buildings, introducing effective waste and water management systems, strengthening institutional set up, educating and making aware of general public for behavioral and attitudinal change, improving financial capacities for investments are some of possible practices to be concerned in achieving sustainable cities.

Index Terms- Sustainability, Urban Development, Challenges, Practices

1. INTRODUCTION

Sustainable development is defined as a long-term solution of meeting needs of the present without compromising the capacity of future generations, guaranteeing the balance between economic growth, care for the natural environment and social well-being. Debate on sustainable development came to appear in 1987 with the report of the Brundtland Commission which tried to find possible solutions to the problems caused by negative environmental consequences of population increase, economic growth and industrialization. Today, the world is facing many of socio-economic and environmental challenges which can be resolved by achieving sustainable development assuring social progress, environmental balance and economic growth. United Nations (UN) in 2015 has published a new road map called '2030 Agenda' to make a sustainable world by the year 2030 (Figure 1). This Agenda contains 17 Sustainable Development Goals to call actions to ensure the global well-being of the people protecting the earth.

Achieving sustainable cities is one of the goals of 2030 Agenda of UN which focus on making cities inclusive, safe, resilient, and sustainable for all. Cities will play a central role in the ability of nations to achieve sustainable development. Today, cities and towns have become the primary human living space. Since 2007, more than half of the world's population has been living in urban areas and this figure is estimated to exceed 68 percent by the year 2050. Although, cities are the power houses of economic growth and development contributing about 60 percent of global Gross Domestic Product in other way, they have created a numerous of complex social and economic impacts with often severe environmental consequences including the greatest contribution to atmospheric, water and ground pollution due to large concentrations of people and activities. This is exacerbated in the South by rapid and continuing urbanization. Sustainable cities are the cities designed with consideration for social, economic, environmental impacts, and resilient habitats for existing populations, without compromising the ability of future generations to experience the same. These cities are inhabited by people whom are dedicated towards minimization of required inputs of energy, water, food and output of wastes, heat, air pollution and water pollution. Achieving sustainable cities is one of the most important and difficult tasks for the coming decades since

present cities are facing numerous challenges associated with rapid increase of population, negative impacts of globalization and economic restructuring. In this respect, this article attempts to discuss the future trends in urban growth, challenges for sustainable city development and applicable strategies in achieving sustainable urban development.



Figure 1: Millennium Development Goals by United Nations by 2030
Source: <https://unhabitat.lk>

II. URBANIZING THE DEVELOPING REGIONS

Today, the world is undergoing the largest wave of urban growth in the history. As revealed by United Nations, Department of Economic and Social Affairs (UN DESA, 2019), today half of the people which is 55 percent of the world's population is residing in cities. In 1950, 30 per cent of the world's population was urban, and by the year 2050, 68 percent of the world's population is projected to be urban. The urbanization process is expected to continue for next decades and an-ever-increasing majority of humankind will likely be living in urban areas. Much of this urbanization will take place in developing countries especially in Africa and Asia, bringing huge social, economic and environmental transformations. Urbanization has the potential to create a new era of well-being, resource efficiency and economic growth. But cities are also home to many socio-economic and environmental issues and how the world meets the challenge of sustainable development will be intimately tied to this process. Rapid growth of cities will be a major challenge to archive sustainable development in 2030 if the cities are not properly planned and managed. Attempting to discuss the world urbanization prospects and challenges will be important to identify key urbanization trends and issues and develop and promote approaches that can draw on the potential benefits of urbanization while avoiding its destructive tendencies.

In 1800, only 3 percent of the world's population lived in cities, but this figure rose to 47 percent by the end of the twentieth century (Seto, Solecki and Corrie, 2016). The world's population has gone through a process of rapid urbanization since 1950. According to the data published by (UN DESA, 2014) in 1950, more than two-thirds (70 per cent) of people worldwide lived in rural settlements. In 2007, for the first time in history, the global urban population exceeded the global rural population, and since then the number of the world's city dwellers has continued to grow faster than the rural population (Figure 2). In 2030, the share of the world's population living in urban areas is expected to reach 60 percent (Figure 3) and it has been projected that by the year 2050, the world will be more than two-thirds urban (68 percent). Over the coming decades, the level of urbanization is expected to increase in all regions, but with considerable variations (UN DESA, 2019).

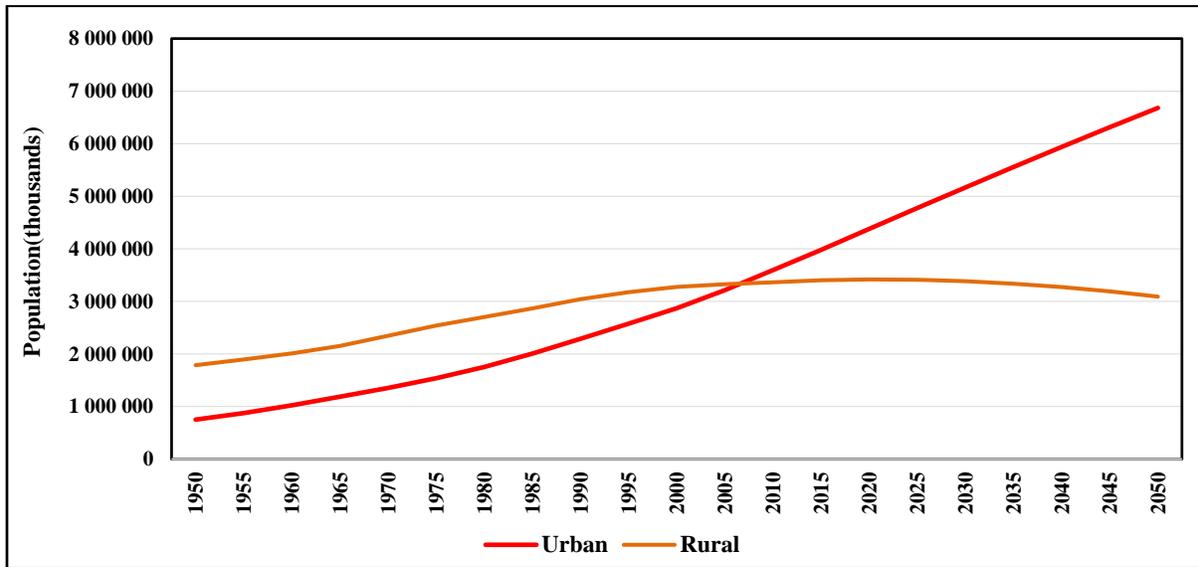


Figure 2: Rural and Urban Population in the World from 1950 to 2050
 Source: UN DESA, 2019

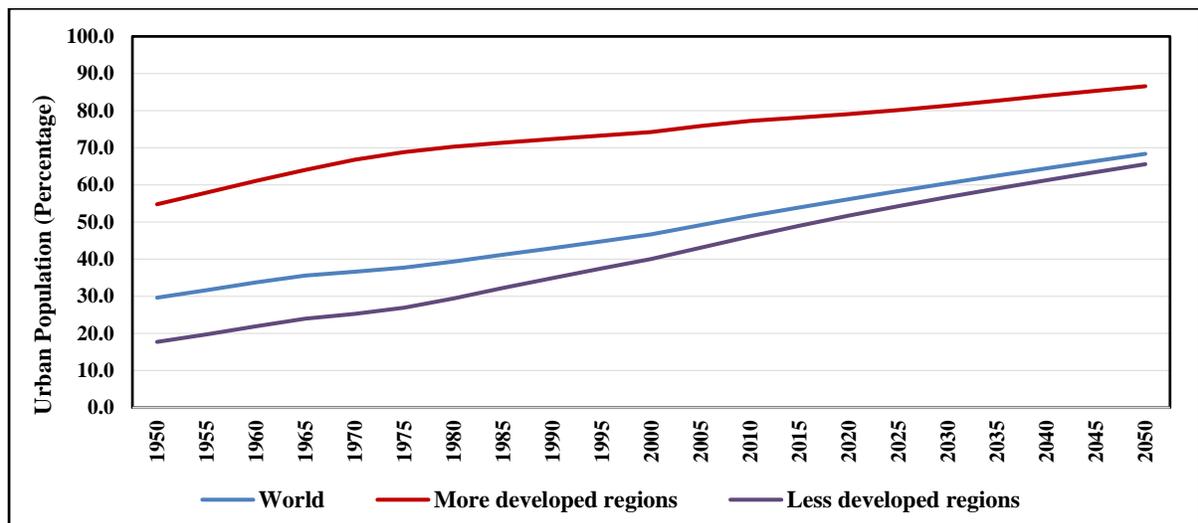


Figure 3: Urban Population in the World from 1950-2015
 Source: UN DESA, 2019

Growth of urban population is driven by an overall population increase and by the upward shift in the percentage of population living in urban areas. Together, these two factors are projected to add 2.5 billion to the world’s urban population by the year 2050, with almost 90 percent of this growth happening in Asian and African countries. According to the Figure 4, today the most urbanized regions worldwide are North America (82.6 percent), Latin America and the Caribbean (81.2 percent), Europe (74.9 percent) and Oceania (78.3 percent) (UN DESA, 2014). In contrast, African and Asian regions remain mostly rural, with 43.5 percent and 51.5 percent of their respective population living in urban areas. But over the next few decades, urbanization will continue, particularly in Asia and Africa with population growth rates of 3-5 percent per year. The UN Predicts that, by 2050, 65 percent of population in developing countries and nearly 90 percent of population in developed countries will live in urban areas. It also appears that most of the world population growth will be absorbed by cities of the south over the next fifty years (Khan, 2008). Asian cities will play a major role in this ‘urban transition’ (Roberts and Kanaley, 2007).

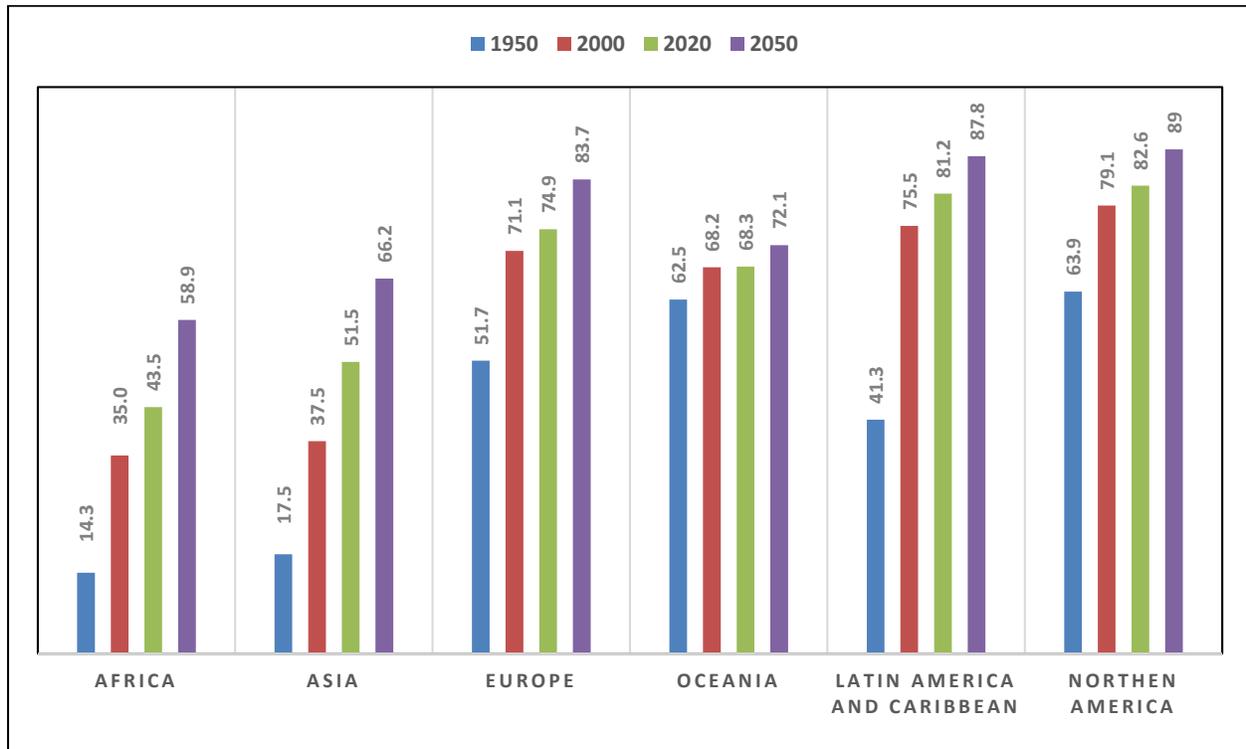


Figure 4: Urban Population in Different Regions from 1950-2050
 Source: UN DESA, 2018

Just three countries-India, China and Nigeria with their high population growth rates are expected to account for 35 percent of the growth in the world's urban population between 2018 and 2050. India is projected to add 416 million urban dwellers, China 255 million and Nigeria 189 million. Close to half of the world's urban dwellers reside in settlements with fewer than 500,000 inhabitants, while around one in eight live in 33 megacities with more than 10 million inhabitants. Moreover, the rapid rates of urbanization have led to the growth of megacities of over 10 million in developing countries. In 1975, there were three megacities in the world: Tokyo, New York and Mexico City. In 2005, there were 20 such cities, 16 of which were located in the developing world. By the year 2030, the world is projected to have 43 megacities, most of them in developing regions (UN DESA, 2005). Tokyo is the world's largest city with an agglomeration of 37 million inhabitants, followed by Delhi with 29 million, Shanghai with 26 million, and Mexico City and Sao Paulo, each with around 22 million inhabitants. Cairo, Mumbai, Beijing and Dhaka all have close to 20 million inhabitants. All these situations signal the cities their challenges coming in near future in relation to improving of human well-being.

III. CITIES AS ENGINES OF GROWTH AND DEVELOPMENT

Towns and cities are formed and become larger through time as more people begin living and working in towns and cities. Today, they have become most powerful, irreversible and essential parts of most nations' development because they act as engines of economic growth and modernization of a country. Cities have powered the world economy for centuries. Today cities contribute up to 55 percent of Gross National Product in low-income countries, 73 percent in middle-income countries and 85 percent in high-income countries (Pisano et al, 2014). In some cases, the contribution of a single megacity, for example, Sao Paulo or Bangkok, can be as high as 40 percent of the Gross National Product while comprising only 10 percent of the population of their respective countries (Keivani, 2010). Cities are more productive than rural areas due to the economies of agglomeration effect. They are equipped with infrastructure, services, communications and skilled labor and can achieve economies of scale, agglomeration and urbanization. Agglomeration economies have positive benefits of economic activities when firms are located in close proximity with those engaged in similar businesses. Cities generate positive externalities of agglomeration, scale, diversity and specialization. Cities serve as market centers in providing wide variety of consumer goods, and commercial and personal services through small-scale enterprises and through the informal sector activities. They are the centers of distribution, transfer, storage, brokerage, credit and financial services. They provide convenient locations for decentralizing public services creating greater access for both urban and rural residents to public services and facilities. They act as local or regional centers for the provision of variety of services and facilities such as health, education, welfare, recreation etc. Cities help rural producers in many ways. They act as market centers for rural produce. Many cities act as agro-processing and agricultural supply centres for their regions and their hinterlands. Cities are magnets for non-farm employment and supplementary income opportunities for rural people through remittances of migrants. At the same time, they serve as centres of transportation and

commercialization, linking their residents and those of rural villages and towns in their hinterlands to larger cities and other regions in the country. Regional cities can absorb the rural migrants that might otherwise move more directly to the largest city or national capital. Cities provide more opportunities for learning and sharing. They are the centers of knowledge, innovation and specialization of production and services. High concentration of people in cities generates more opportunities for interaction and communication, promotes creative thinking, creates knowledge spillovers and develops new ideas and technologies. They accommodate social heterogeneity and encourage the integration of people from diverse social, ethnic, and religious groups, provide organizations that help to socialize and assimilate rural people into city life, and infuse new attitudes, behavior and life-styles that are more conducive to urban living; and give new opportunities for social and economic mobility. The other side of the significance of cities is that cities are better poverty fighters than their rural counterparts. Economic growth is highly correlated with poverty reduction, the high growth of cities bodes well for poverty reduction. All these potentials and opportunities make cities more attractive to the people and to become homes to billions of people.

IV. SUSTAINABLE CITIES: CONCEPTUAL MEANING

The concept of sustainable cities and its link with sustainable development have been discussed since the early 1980s. It has been suggested that the building of a “green” city is equivalent to the building of sustainability (Beatley, 2012). Many countries are planning and engaged in building ‘green cities’ and ‘eco-cities’ as a starting point for building of sustainable cities. However, it is important to understand cities’ sustainability as a broader concept which integrates social development, economic development, environmental management and urban governance which are as municipal authorities responsible for the management and investment decisions in coordination with national authorities and institutions.

Report published by the Brundtland Commission (World Commission on Environment and Development) in 1987 has defined sustainable development as development that meets the needs of the present, without compromising the ability of future generations to meet their own needs ([https://en.wikipedia.org/wiki/Brundtland Commission](https://en.wikipedia.org/wiki/Brundtland_Commission)). In 2000, Sustainable Cities Programme of the United Nations Centre for Human Settlements (UNCHS) and United Nations Environment Programme (UNEP) has attempted to define a sustainable city as one “where achievements in social, economic and physical development are made to last” (UNCHS and UNEP, 2000). According to Rees (1992) sustainable city must have a low ecological footprint and reduce risk transfer (economic, social and environmental) to other locations and into the future. As Satterthwaite in 1992 pointed out sustainable cities should meet their inhabitants’ development needs without imposing unsustainable demands on local or global natural resources and systems. Presently, consumption patterns of urban middle-and high-income groups are responsible for the use of a significant portion of the world’s finite resources and contribute significantly to the production of polluting wastes. Sustainable development should focus on better living and working conditions for the poor, including affordable access to, and improvement of, housing, health care, water and sanitation, and electricity. In 1992 Rio de Janeiro Conference on Environment and Development (Earth Summit) integrated the economic, social, environmental and governance dimensions of sustainability and argued for the eradication of unsustainable patterns of production and consumption, the eradication of poverty, and the role of the State, civil society and international community in protecting the environment (UN, 1993). The Habitat Agenda of the United Nations Conference on Human Settlements (Habitat II), held in Istanbul 1996, has discussed urban sustainability as requiring a harmonious integration of economic, social and environmental issues (UN, 1997). At this summit climate change as one of the main threats to building sustainable cities and to development has been included. At the first session of the World Urban Forum convened at the headquarters of the United Nations Human Settlements Programme (UN-HABITAT) in Nairobi 2002, an in-depth discussion has been held on urbanization in the context of sustainable development and affirmed that addressing economic, social, environmental and governance issues was integral to the creation of sustainable cities, and that the inability to address those issues would prevent the achievement of sustainable development (UN DESA, 2013).

As discussed above, according to the present trends of urbanization all most all the counties are becoming increasingly urbanized demanding more sustainable ways of living and urban governance should involve the fostering of urban planning and environmental management which includes the reduction of ecological footprints, and the decentralization of decision-making, and resource allocation, as well as enhanced policy coordination between local and national authorities. In this context, achieving the sustainability of cities can be conceived as entailing the integration of four pillars: social development, economic development, environmental management, and urban governance. Figure 4 presents the four pillars for achieving urban sustainability encompassing the balanced accomplishment of social and economic development, environmental management and effective governance. For achieving the sustainable cities these four pillars should be integrated by solving problems related to each pillar and needed to be maintained.

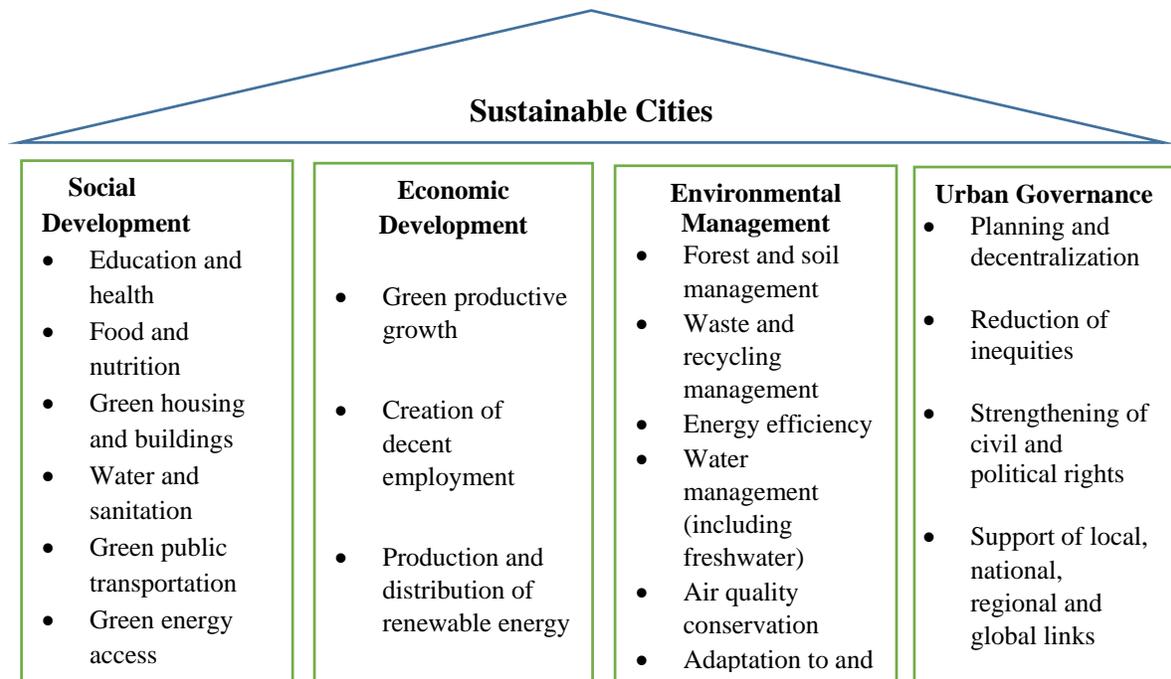


Figure 4: Pillars of Achieving Sustainability of Cities
 Source: UN/DESA, 2013

V. KEY CHALLENGES ON THE PATH

It is witnessed that today, rapid as well as haphazard growth of cities has become a threatening factor to the world's sustainable prosperous future. There is no doubt that cities have become the world's major growth engines with their numerous potentials for socio-economic development but uncontrolled increase in urban population undeniably brings tremendous challenges in achieving sustainable development.

With the concern of magnitude of present and future growth of city population, one of the major challenges faced by most of the cities today as well as in future is uncontrollable rural-urban migration. This is a prominent problem in developing countries where higher percentage of population live in rural areas. In these countries rapidly increasing share of the population migrates to cities in searching for employment opportunities in industrial enterprises and the service sector. Although, these countries in the past, have implemented some national rural development schemes such as providing urban amenities to rural areas and improvements in infrastructure and development in villages, researches shows that rural-urban migration is unlikely to reduce through such activities and ironically may even increase because of recent trend in enabling higher mobility of rural households. In most of developing countries rural people are suffering from various problems especially insufficient income due to low productivity of crops, land fragmentation, unemployment and under employment and ultimately social and economic deprivation and these factors lastly become push factors to them to migrate to cities. In this connection, the unavoidable result is the rapid growth of low-income housing termed as urban 'slums' and 'squatter settlements. Close to 1 billion people, or 32 percent of the world's current urban population, live in slums in inequitable and life-threatening conditions, and are directly affected by both environmental disasters and social crises (UN Habitat, 2003). A slum household is defined as a group of individuals living under the same roof lacking access to improved water, access to improved sanitation, sufficient living area, and durability of housing. Many people move to cities primarily because cities promise more jobs, better schools for poor's children, and diverse income opportunities than subsistence farming in rural areas (Baker, 2008). For example, in 1995, 95.8 percent of migrants to Surabaya, Indonesia reported that jobs were their primary motivation for moving to the city (Prinjono, and Hasmi, 2005). However, some rural migrants may not find jobs immediately because of their lack of skills and the increasingly competitive job markets, which leads to their financial shortage. Heavy migration from rural areas definitely contribute to the problem of overcrowding of cities which is too many people occupying little space in many cities in developing countries. Today, most of the cities in all over the world are suffering from the problem of overcrowding and create huge problems such as congestion, unemployment, land, air and water pollution with rubbish, sewage and carbon and social crimes.

The main problem faced by governments of these countries due to this intense rural-urban migration is provision of adequate, affordable and quality basic services such as education, health, sanitation, and affordable housing for the continuously increasing population. The decent affordable housing is fundamental to the health and well-being of the people and the poorest city dwellers all over the world are struggling to meet affordable housing. Currently some 330 million urban households cannot access affordable and secure

accommodation. This has been forecasted to grow by more than 1.6 billion people by 2025 (McKinsey Global Institute, 2014). Urban poor are extremely exposed to many disasters and health risks residing in environmentally sensitive areas where flooding and sometimes landslides are prominent and highly affected by natural disasters. They are under the significant health risk such as spread of diseases. With all these vulnerabilities in life their standard of living is very low and improving their living status is really a big challenge for developing nations.

Although, high performing, cost-effective, resource-efficient and environmentally-friendly urban infrastructure is central to sustainable cities providing such a quality infrastructure also a challenging task today for many countries in the light of stress caused by massive expansion of population in cities. Urban infrastructure refers to the engineered system of water, energy, transport, sanitation and communication that make up a city. Cities must build, maintain and upgrade extensive transport, power, water and telecommunication networks, in order to continue with the demands of economic development and population growth without damaging the natural environment. Infrastructure is essential to continue to progress of societies and improve living standards. Transport networks remain as the heart of cities and if they are insufficient, inefficient and not environmentally friendly to meet demand, urban economies, societies as well as environment can be severely impacted. The current transport systems in developing countries are contributors of major energy consumption and burn fossil fuels, high noisy and high emission of greenhouse gases which invite a wide range of problems including global warming, environmental degradation, and physical and mental health implications. The growth of greenhouse gas emissions from transport is expected to continue throughout the world. In 2050, as much as 30-50 percent of total CO₂ emissions are projected to come from the transport sector compared with today's 20-25 percent (Alcamo et al, 2000). Within the transport sector, road transport is the largest contributors to global warming.

Heavy traffic congestion in public roads is a main problem created by insufficient transport networks in many developing countries resulting in massive delays, increased fuel wastage and monetary losses. Commuters stuck in traffic can be loss of a number of working hours, reduce output and negative health outputs. For examples, presently cost of traffic jams in Manila per year in terms of lost potential income has been estimated at \$2.4 billion and this could be rise up to \$142 a day by the year 2030. Cost of traffic jams in Sao Paulo has been estimated as \$17.8 billion a year in lost productivity, wasted fuel and adverse earth from vehicle emissions. To overcome all these negative impacts long-term planning and investment is essential for avoiding the negative economic and environmental consequences of insufficient and inefficient infrastructure.

Creating a sustainable waste management system also has become one of the challenges for the cities especially in developing countries. Waste management is the practice of collecting, transporting, processing or disposing of managing and monitoring various waste materials. In developing countries with the rapid increase of population waste generation is increasing day by day, but appropriate treatment and disposal techniques are rare. With rapid population growth and urbanization, annual waste generation is expected to increase by 70 percent which is 3.40 billion tons from 2016 to 2050 (The World Bank, 2019). Compared to those in developed nations, residents in developing countries, especially the urban poor are more severely impacted by unsustainably managed waste. In low-income countries, over 90 percent of waste is often disposed in unregulated dumps or openly burned. Absence of proper practices in waste sector create problems related to cleanliness and environmental sustainability including rising greenhouse gas emissions, insanitary public spaces, smelly garbage, growing energy demand and low recycling rates. Poorly managed waste serves as breeding ground for disease vectors, contributes to global climate change through methane generation. Managing waste properly is essential for building sustainable and livable cities, but it remains as a big challenge for many developing countries and cities.

One of the other most significant environmental challenge at present cities are facing is the negative impacts of climate change. Today, climate change poses serious threats to urban infrastructure, quality of life, and entire urban systems. Not only poor countries, but also rich ones will increasingly be affected by anomalous climate events and trends (World Bank, 2010). Rising global temperatures causes sea level to rise, increase the number of extreme weather events such as floods, drought and storms and increases the spread of tropical diseases. Vehicle emissions in cities contribute significantly to greenhouse gas emissions and hence global warming. All these events have costly impacts on cities, basic services, infrastructure, housing human livelihoods and health. According to the UN Environment's 2019 Global Environment Outlook report, the cities in USA which will be mostly impacted by climate change in coming decades tend to be coastal and heavily populated.

Traditionally, most of the cities were located near rivers and oceans for transportation and connectivity purposes. This natural geographic advantage is now increasing vulnerability of cities as sea levels rise and wind storms increase in severity and frequency. In Europe, 70 percent of the largest cities have areas that are particularly vulnerable to rising sea levels, and most of these cities less than 10 meters above sea level. Port cities in developing countries such as Kolkata, Shanghai are as vulnerable as such cities in developed countries such as Rotterdam, Tokyo, or New York City. China alone has more than 78 million people living in vulnerable low elevation cities and this number is increasing annually at 3 percent (McGranahan and Anderson, 2007). In 2003, more than 70,000 people died in Europe from a severe heat wave (World Bank 2009, Dhainut et al. 2004). Especially, the poor city dwellers are vulnerable to climate change. Poor city residents tend to locate in the most vulnerable locations and housing construction materials are not robust. The consequences of surging seas, wind storms, and flooding are much more dramatic in these areas. In other way, cities are a key contributor to climate change as urban activities are major sources of greenhouse emissions. Estimates suggest that cities are responsible for 75 percent of

global CO₂ emission with transport and building being among the largest contributor. In addition to the transport, the energy usage for the purpose of public lighting and industrial, commercial and building consumption is another main source of emissions. Industrial sector is responsible for 43 per cent of the global carbon.

Maintaining air quality also is a challenging task for cities today. Air pollution is one of the biggest threats in cities today which adversely affect the health of the city residents and city environment. According to World Health Organization (WHO) most recent survey of more than 4300 cities in the world says that only 20 percent of the urban population comply with WHO air quality guideline level for MP2.5. Average air quality level in many developing cities is PM₄ to PM₁₅ which is greater than WHO guideline putting many at risk of long-term health problems (WHO, 2019). Air pollution is a silent killer which causes asthma and chronic respiratory illness and other kind of breathing problems and reduce lung function. Air pollution in cities in low and middle income countries has become worsen over the last several years. Many factors contribute to this trend including mainly industrial emissions, increased urban power demand which drives up power emissions and increasing use of private motor vehicle transport. In these countries burning of solid waste and agricultural waste in peri-urban areas and use of solid fuels such as coal biomass for cooking and heating also are serious air pollution issues. 25 percent of households in less-developed cities are dependent on solid fuels for cooking. These households suffer from a double air pollution burden - polluted air outside as well as polluted air inside the homes (WHO, 2019).

The role played by the national and municipalities is crucial in making cities sustainable. All transformations toward sustainability is linked with a strong and efficient institutional arrangement and investments. A strong and efficient institutional set up and investments are essential for a country to work toward sustainability. Policy formulations, effective decision-making and project implementations as well as socially, economically and environmentally viable urban planning toward sustainable cities should be done through a strong link between public and private sector institutions. Compared to developed nations, severe institutional weaknesses and lack of materials and financial resources have become greatest challenges in working toward the sustainable cities in many developing countries. Absence of strategic economic vision, the lack of coordination among various levels of government compartmentalized sector and impacts of political instability in developing countries lead to both ineffective and inefficient policy interventions and wastage of resources.

The other related concern is the lack of national and Municipal finance. This is highly important not only to the municipal investments for capital projects to support economic activities but also the provision of essential city services such as green space, garbage collection, recycling, street lighting, and offering social support activities such as community development activities and raising municipal revenues. Financial support from national Governments and donor agencies is often minimal, and provided, typically, only for the initial construction of infrastructure and not for ongoing operations. In general, cities rely mainly on fees, tariffs and property taxes. However, property valuations can be out of date or incomplete, while capacities to collect taxes remain weak. Many national governments and municipalities in developing countries are suffering from this issue and if this is not addressed through creation of a sustainable policy framework for enhancing financial capacity, sustainable cities may be a dream for developing countries.

VI. THE WAY FORWARD FOR SUSTAINABLE CITIES: SOME PRACTICES NEEDED

With all above challenges building of sustainable cities is a daunting task, but not an impossible one. For this purpose, a holistic urban development approach which is able to address all the areas of social, economic, environmental and institutional is needed. It requires a comprehensive and coordinated change in behavior, and government at all levels to cooperate, invest, share ideas, replicate best practices, and plan for the long term. Therefore, looking at what kind of sustainable practices needed to make cities inclusive, safe, resilient, and sustainable is utmost important. By getting right urban development with sustainable practices cities can create jobs and offer better livelihoods, increase economic growth, improve social inclusion, promote the living standard, protect local and regional environment and reduce both urban and rural poverty.

(a) Promoting rural development

Rural development of a country is an essential part of building of sustainable cities. Even though rural and urban areas are considered as detached entities, they are mutually dependent in their development. These two areas are absolutely connected each other in terms of complex linkages such as physical, social, economic, infrastructural, demographical technical, attitudinal and environmental and the intensity of these linkages vary region to region depending on different factors or situations in each region. As studies from the different part of the world have shown rural-urban linkages have been strongly established in developed countries with high rate of urbanization than developing countries where rural-urban linkages are mostly weak with slow and low rate of urbanization. These links between rural areas and cities should be properly understood and should be strengthened because they can facilitate sustainable development in both urban and rural areas by delivering services and infrastructure improvements and expanding opportunities for off-farm employment to rural dwellers. Investments to develop physical, economic and social infrastructure in rural areas will strengthen all kind of linkages between these two areas and can be a catalyst for reducing the problem of intense rural-urban migration.

(b) Shifting to environmentally-friendly and affordable public transport

Shifting from traditional, expensive and inefficient transport system to rapid, reliable, accessible, affordable and eco-friendly public transportation is an essential requirement for sustainable cities. Promoting efficient-less energy consuming public transport networks that prioritize rapid bus transit or light rails over private vehicles can reduce the long-term impacts of both air pollution and climate emissions which are generated by private transport and improve health equity by providing better mobility. Today the concept of 'car free cities' or a 'city with large pedestrian areas' is often part of the design of sustainable city development in most of European countries. A large part of the carbon footprint of a city is generated by cars so the car free concept is often considered an integral part of the design of a sustainable city. Simultaneously, use of diverse fuel-efficient transportation vehicles in order to reduce greenhouse emissions and diversity fuel demand is also important. Due to the increasingly expensive and unstable cost of energy, this strategy has become very important because it allows a way for city residents to be less susceptible to varying highs and lows in various energy prices.

Walking paths and cycling infrastructure which are already used by most of European countries also are very important for internal circulation in cities because they are comparatively easy and inexpensive. This non-motorized travel systems can support healthy physical activities and further reduce air pollution and climate emissions with zero-emissions transport modes, as urban population become more mobile. Compact cities served by transit and dedicated walking and cycling networks are more energy-efficient and safer for pedestrians and cyclists.

(c) Shifting to renewable energy sources for transportation and buildings

Buildings and transport sector are major high energy consumers in cities and fossil fuels are the main energy sources of most of the cities in developing countries which bring many environmental issues, climate change and global warming. Therefore, replacing of fossil fuels with alternative energy sources especially renewable energy which do not produce harmful impacts is essential cities to be sustainable. Renewable energy is the energy produced by natural resources such as sun light, wind, rain, waves, tides, geothermal and bio mass heat that are naturally replenished within a time span of a few years. The most important feature of renewable energy is that it can be harnessed without the release of harmful pollutants. They are environmentally friendly sources of energy that do not pollute environment and do not contribute to climate change and global warming like traditional energy sources do.

Buildings should be designed and operate so as to use less energy and generate less energy. Buildings are responsible for substantial CO₂ emissions, owing to the materials used in their constructions, their cooling and heating requirements, and auxiliary functions such as water supply, wastewater, and solid-waste disposal. Building codes should be changed to promote energy-efficient engineering and construction technologies, which can be supported by tax incentives and stricter regulations.

(d) Introducing effective waste management systems

Waste management is one of the key service city government must provide. Waste generation is putting numerous pressures on local government especially in the rapid growing cities in Asia, Africa, and Latin America. Poorly managed waste and lack of sanitation have impact on climate, health, environment and economy. Waste sector of these countries needs greater attention in establishing sustainable waste management systems to improve waste collection, transport and safe disposal of Municipal waste. Municipalities should enhance waste infrastructure development to deploy cost-effective and efficient waste collection and transport services. All at once, policies should be designed to manage disposal and recovery facilities such as landfill, composting, landfill gas utilization, material recovery facilities eliminating open dumping and open burning, waste recovery infrastructure and improving recycling and segregation.

(e) Reformation of managing water resources

Water sustainability begins with protecting water resources. A wide range of measurement can be implemented for the protection of water resource especially in terms of reduction of water wastage both in infrastructure sector and among users. New rules and regulations should be implemented toward protecting and storing water. In this connection, technical practices to secure and protect the existing natural water resource and use of local knowledge as part of sustainable water resource development are important.

Peoples' education and awareness about the water resources is much important in protecting and using water. Peoples' awareness regarding water scarcity and limited nature of the water and its significance to sustain ecosystems will contribute to preserve water and to minimize the pollution releasing to the water bodies such as lakes, rivers and reservoirs. Effective practices for using water resources will greatly benefit the human livelihood and the environment. This requires integration of various aspects of water management, such as household supply, re-use of water several times in urban areas, rain water harvesting, waste water treatment and recycling, and flood-control measures.

To enhance sustainability of water resource management, conducting relevant research on challenges and barriers associated with practices of water-quality management is also very much required. A number of related methodologies, applications and policy implementation should be examined.

(f) Capacity building of institutions and general public

Sustainable city development is a collective effect of various institutions, organizations and inhabitants of the city. Consequently, building of capacities needed to be done at the institutional level as well as at the societal level especially in developing countries. At the institutional level appropriate changes should be done to change the work culture to improve the integration, coordination, efficacy

of working, skills and knowledge and dedication for work. At the societal level a change in values and norms, life goals and expectations and consumption patterns should be done through public awareness programs and educating the people.

(g) Improving financial capacities for investments

Since working toward sustainability is costly both central government and city governances should improve their financial capacity for more investments. In this connection, promoting public-private partnerships is a viable instrument for raising funds for financing infrastructure projects particularly in developing countries. Introducing efficient tax system, formulation and implementation of revenue enhancement strategy for municipalities, granting more autonomy to municipalities in generating financial resources for their development activities are some of such possible strategies for improving financial capacities. Access to international funding agencies, national and private banks and making a better platform to attract private investors also are important for increasing finance for investments.

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Determine the Factors Affecting Students Eating Habits Change: A Study in Rajshahi University

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DOI: 10.29322/IJSRP.10.09.2020.p10535

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10535>

Abstract-Eating habits is one of the most important public health concern for all stages of human life as well as students' life, especially those are going to face changing life style by the change of living place from present to some where else for short or longer time due to profession or study like higher study. In transition time student's need to adjust with somewhat different environment like university life, residence, exams etc. because these are create an obstacle situation against adoption of healthy food habit. Therefore, they need to change their as usual food habits and this change can't be balanced and healthy always among university students because most of them needs to eat away from home. The aim of this study is to examine the food consumption behavior and influential factors of changing eating behavior of university student's. Primary data collected from 250 respondents using structured questionnaire from different departments of Rajshahi University. Descriptive analysis, bivariate analysis and Garratte's ranking technique are used for examining the changing food habit of the students. The study has been revealed that present residence, eating place, aware of healthy food, intakes healthy food and changing diet to reduce weight have significant association with eating habits of the students. In spite of change food habit, nutritional level of the majority students (57%) have found normal whereas 14.5% and 3.0% are underweight and obese respectively. University authority should take proper initiative for improving healthy eating behaviors and to adopt nutritional education interventions among university students.

Key words: Eating habits, Students, Foods, Rajshahi University and Health.

1. INTRODUCTION

Eating habits is one of the most important public health concerns among young-adults who experienced transition into university study life. A balance diet contributes for maintaining a healthy lifestyle of people of a country including university students. Moreover, a student needs to spend almost five (5-6) to six years for completing their higher study in University or other higher study institutions in Bangladesh. For this reason, they must have to change their as usual food habits that influence on eating habits (Pierce, et al., 1992) of students. Hence, specific university features including university lifestyle, residence, and exams pose an obstacle against adoption of healthy behaviors (Lupi, et al., 2015; Deliens, et al., 2014; Gan, et al., 2011). Certainly unhealthy eating behaviors among university students are common matter because they are eating away from home, fast food intake, and irregular breakfast (Lupi, et al., 2015). These unhealthy eating behaviors are the main cause of the university student's fall in danger as nutritionally vulnerable group with poor eating habits. There are also several factors behind university characteristics which are also responsible for adoption of unhealthy eating habits among university students. These factors are physical environment, social environment, macro environment, and individual characteristics. In addition, university students who live outside from their family, generally tend to prepare their own food (Bagordo, et al., 2013; Santisi, et al., 2014) on the basis of food cost, ability to cook, and availability of fast food. Furthermore, it is well known that the students have numerous troubles to maintain their healthy eating habits due to different obstacle like exams, university lifestyle and student societies, distance of market, cost of food and so on (Johansen, et al., 2006; Deliens, et al., 2014).

Students come at university from different regions of a country for their higher educational purposes. They hold different cultures, customs, and eating habits before getting admit in the University but they are accustomed with new cultures, customs, and eating habits during University life. Moreover, some of the students come from poor family and they are not able to spend enough money for eating healthy food. At the same time, some of them can't prepare food by their-self. So, students are constrained to eat unhealthy food. Therefore, factors influencing eating habits of university students are essential (Diez, et al., 2009) for planning future interventions that lead to consume healthy food and reduce to consume unhealthy food even due to their financial constraints and inability to prepare at residence by self. Malnutrition and chronic disease among undergraduate students (Nelson, et al., 2009) are the cause of consumption of unhealthy food. To the best of our knowledge, most probably there is no mentionable study on this type of field directly in Bangladesh that factors influencing eating habits of university students. From this view, this study on factors influencing eating habits of university students is important. Taking consideration this background, it is required to pay special attention to university students as they are nutritionally vulnerable groups with poor eating habits. This study aims to observe the changing food consumption behaviour and determine its affecting factors of University students and provide some recommendations to ensure healthy eating behavior.

II. OBJECTIVES

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10535>

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The objectives of this study are as follows:

- to observe the students eating habit change and awareness about healthy food taking behavior during university study life,
- to evaluate the foods and beverages consumption behavior and measure nutritional level of the students during university study life and
- to examine the association of different influential factors with food habit change after admission in university of the students.

III. DATA AND METHODOLOGY

According to the intention of the study factors influential changing eating habits of the students, this study considered students as respondent who have at least one year study experience in present university. A total of 250 respondents data are collected using purposive sampling method from the different departments of Rajshahi University. Structured questionnaire is used for data collection through direct interview. Descriptive and bivariate analyses are used to explore the association of different influential factors of changing eating habits after admission in university. Along with Garratt’s ranking technique is used for measure the changing eating habits and BMI is used for nutritional status measure. All techniques are analyzed through Statistical Packages for Social Sciences (SPSS) version 22.

A. Garratt’s ranking technique

Garrett’s ranking technique (Dhanavandan, 2016) is used to find out the most significant influential factors of the respondent’s changing food habit behavior. Purposes of this method, respondents have been asked to assign the rank for all factors and the outcome of such ranking has been converted into score value with the help of the following formula:

$$\text{Percent position} = \frac{100(R_{ij} - 0.5)}{N_j}; \text{ Where, } R_{ij} = \text{Rank given for the } i\text{th variable by } j\text{th respondents; } N_j = \text{Number of}$$

variable ranked by *j*th respondents

With the help of Garrett’s Table, the estimated percent position is converted into scores. Thereafter, the scores of each individual are used to calculate the total value of scores and mean values of score. The factors having highest mean value is considered to be the most important factor.

B. Measurement of nutritional status

Body mass index (BMI) is the indicator of body fitness that indicates underweight, normal weight, over weight and obesity. It is a number that shows body weight adjust for height. For South Asian population the suggested BMI (kg/m²) cut-offs are underweight (<18.5), normal weight (18.5-23), over weight (23-27.5), obesity (>=27.5). BMI is calculated by dividing a person’s weight in kg by the square of his/her height in meters.

$$BMI = \frac{\text{Weight (kg)}}{\text{Height}^2 (m)}$$

IV. RESULT

A. Socioeconomic and Demographic Background

Out of total the respondents, male and female students are 62.4% and 37.6% respectively. Average age of the respondents is 22.13 years. From Figure 1 it is found that about 39.5% respondents are from fourth year and 20%, 28% and 12.5% are from second, third and masters. Among them only 11.6% are married. Most of the respondents (89.0%) are being into Islam and 10.5% from Hindu and only 0.5% others.

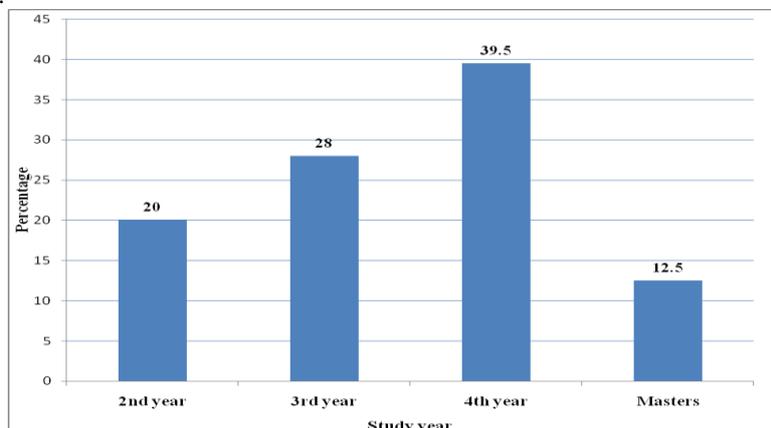


Table 1 contains that about 26.0% respondent’s monthly family income is very low and 26.4%, 24.0% and 23.6% are low, medium and high respectively. It is found that about 24.4% respondents father are highly educated and 16.0%, 21.6% and 10.4% are primary, SSC, and HSC respectively. On the other hand, about 34.8% respondents mother’s educational qualification is primary and 21.6%, 11.2% and 6.8% are SSC, and HSC and higher respectively. About 88.0% respondents mother are housewife who are not engage other occupation and about 7.6% are employees and rest of them are involved in other activities. Whereas, about 30.4% respondent’s father are engaged in agriculture and about 18.0%, 23.2% and 24.4% are labour, businessman, and employees respectively (Table 1). It is seen from Table 1 that majority respondents (84.0%) live without family and only 16.0% live with family. In case of the present residence, about 57.6% respondents stay in University hall and 36.4% in mess and only 6.0% in other places. It is also found that majority respondents (66.8%) lived in village. About 9.2%, 10.0% and 14.0% are lived in divisional town, district town and Upozilla respectively.

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Table 1: Percentage distribution of the socio-economic variables of the respondents

Background characteristics	Frequency	%	Background characteristics	Frequency	%
Sex			Marital status		
Male	156	62.4	Unmarried	221	88.4
Female	94	37.6	Married	29	11.6
Age			Lives family or not		
> 22 yrs	159	63.6	With Family	40	16.0
22+	91	36.4	Without Family	210	84.0
Permanent residence			Present residence		
Divisional Town	23	9.2	University Hall	144	57.6
District Town	25	10.0	Mess	91	36.4
Upozilla Town	35	14.0	Others	15	6.0
Village	167	66.8			
Education of Father			Mother's occupation		
Illiterate	51	20.4	Housewives	220	88.0
Primary	40	16.0	Business	8	3.2
SSC	54	21.6	Employee	19	7.6
HSC	26	10.4	Others	3	1.2
Higher	61	24.4			
Father's occupation			Income per Month		
Labour	45	18.0	Very low	65	26.0
Agriculture	76	30.4	Low	66	26.4
Businessman	58	23.2	Medium	60	24.0
Employee	61	24.4	High	59	23.6
Others	10	4.0			
Education of Mother			Religion		
Illiterate	64	25.6	Islam	222	88.8
Primary	87	34.8	Hindu	26	10.4
SSC	54	21.6	Others	2	0.8
HSC	28	11.2			
Higher	17	6.8			

Note: Very low= >11000.00 Tk., Low= 11000.00-20000.00 Tk., Medium= 20001.00-30000.00 Tk. and High= 30001.00= Tk.

B. Comparative Food Choice and Eating Habits before and after University admission

It is found that about 80.8% respondents take their breakfast daily, 8.4% and 10.8% take 1-3 and 4-6 days in a week respectively before admission in university (Table 2). On the other hand, in case of after admission in university, about 54.0% respondents take breakfast daily, 29.2% and 16.8% takes 1-3 and 4-6 days in week respectively. It is seen from Table 2 that about 87.2% respondents take their lunch daily and 3.6% and 9.2% take 1-3 and 4-6 days in a week respectively before admission in university. Whereas, after admission in university, the daily lunch taking habit decrease as 77.6% and 6.44% and 16.0% takes 1-3 and 4-6 days in week respectively.

Out of the total 250 respondents, about 83.2% take their dinner daily and 4.4% and 12.4% take 1-3 and 4-6 days in a week respectively before admission in university (Table 2). On the other hand, after admission in university, daily dinner taking has decreased as 74.0% and about 6.0% and 20.0% take 1-3 and 4-6 days in week respectively. The study reveals that about 12.0% respondents take outside food daily before admission in university but after admission in university it increases as 23.6%. Before university admission, about 45.6% and 8.0% take outside food 1-3 and 4-6 days in a week respectively, whereas after admission in university, about 45.6% and 15.2% take outside food 1-3 and 4-6 days in a week respectively (Table 2). Again Table 2 shows that about 34.4% respondents didn't eat outside food before admission in university and 15.6% don't eat outside food after. Again, it is observed that about 10.4% respondents smoked daily before admission in university but after it becomes 13.6%. Again, about 5.6% and 4.8% students smoked 1-3 and 4-6 days in a week respectively before admission in university, whereas after admission in university it becomes 6.0% and 4.0% smoked 1-3 and 4-6 days in a week respectively. It is also found that about 79.2% didn't smoke before admission in university but it becomes 76.4% after admission in university.

Table 2: Percentage distribution of characteristics of food choice and eating habits of the respondents

Eating habits	Before admission in university		After admission in university	
	Frequency	%	Frequency	%
Breakfast				
Daily	202	80.8	135	54.0
1-3	21	8.4	73	29.2
4-6	27	10.8	42	16.8

Lunch				
Daily	218	87.2	194	77.6
1-3	9	3.6	16	6.4
4-6	23	9.2	40	16.0
Dinner				
Daily	208	83.2	185	74.0
1-3	11	4.4	15	6.0
4-6	31	12.4	50	20.0
Outside food habit				
Never	86	34.4	39	15.6
Daily	30	12.0	59	23.6
1-3 day	114	45.6	114	45.6
4-6 day	20	8.0	38	15.2
Smoking in a week				
Never	198	79.2	191	76.4
Daily	26	10.4	34	13.6
1-3 days	14	5.6	15	6.0
4-6 days	12	4.8	10	4.0

C. Awareness of Healthy Food

Table 3 reveals that about 69.2% respondents like homemade food. Among homemade food chooser, about 36.4% self-cook, 23.2% together (2-4 persons) and 9.6% together more than 4 persons. About 38.4% respondents take food in their residence and 20.0% canteen and 13.6% hotel/restaurant. It is found that about 53.6% respondents don't like to change diet for reducing their body weight. From Figure 2, it is seen that the majority respondents (74.4%) are aware about touch food in the outdoor. Among the total respondents, about 72.8% are aware about fatty food but 27.2% aren't. About 82.4% are aware about healthy food. About 77.2% takes healthy food but 22.8% don't take. The study reveals that about 42.0% respondents spend more than 500 Tk. for food per week, whereas 34% spend 400-500 Tk. and 22.5% less than 400 Tk. It is observed that about 50.8% respondents take allergies contaminated food and 49.2% don't. It is found that about 72.4% avoid salty food but 27.5% don't. It is also observed that about 52.4% respondents never exercise during university study period, whereas only 32.0% do exercise 1-3 days and 15.6% equal or greater than 4 days in a week.

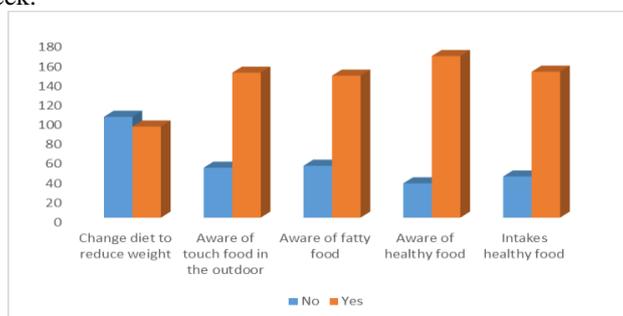


Figure 2: Respondents awareness about food healthy food

Table 3: Percentage distribution of the respondent's health awareness and take healthy food during university study life

Characteristics	Frequency	%	Characteristics	Frequency	%
Do you like home made food			Aware of healthy food		
Yes	131	52.4	No	44	17.6
No	119	47.6	Yes	206	82.4
Prepare meals together			Intakes healthy food		
1 persons	91	36.4	No	57	22.8
2-4 persons	58	23.2	Yes	193	77.2
4+ persons	24	9.6	Spend money for food		
Eating Place			<400	60	24.0
Canteen	50	20.0	400-500	85	34.0
Own Cooking	96	38.4	≥500	105	42.0
Hotel/Restaurant	34	13.6	Allergies from food		
Home	70	28.0	No	123	49.2
Change diet to reduce weight			Yes	127	50.8
No	134	53.6	Avoid salty food		
Yes	116	46.4	No	69	27.6
Aware outdoor touch food			Yes	181	72.4
No	64	25.6	Exercise in a week		
Yes	186	74.4	Never	131	52.4
Exercise in a week			1-3 days	14	5.6
Never	198	79.2	4-6 days	12	4.8
Daily	26	10.4			
1-3 days	14	5.6			
4-6 days	12	4.8			

Never	80	32.0	Aware fatty food No Yes	182	72.8
1-3 day	39	15.6			
≥4 day					
Distance of Market					
<1 km	173	69.2			
1-2 km	47	18.8			
>2 km	30	12.0			

D. Eating Habits during Examination/Classes

It is seen in Figure 3 that about 63.6% take breakfast at home/hall, whereas 16.8% and 19.6% at hotel/restaurant and canteen during exam/classes respectively. It is also found that about 70.4% respondent’s take lunch at home/hall, 15.6% hotel/restaurant and 14.0% canteen during exam/classes. On the other hand, in case of dinner, about 74.8% home/hall, 11.6% hotel/restaurant and 13.6% canteen.

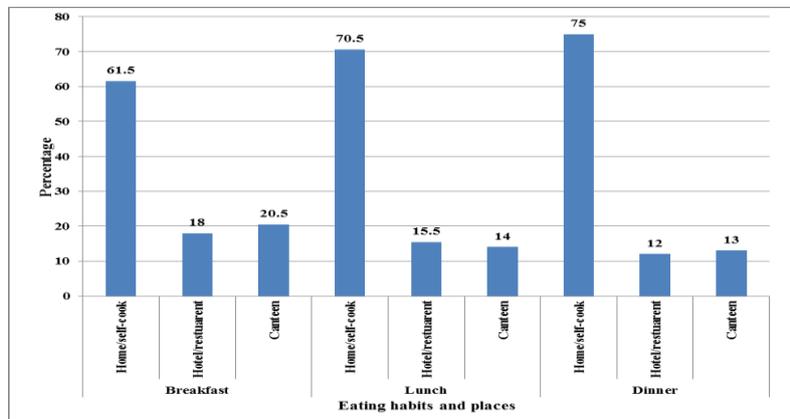


Figure 3: Respondents eating habits and place during class/exam

E. Foods and Beverages Consumption Behaviour

Figure 4 contains that about 43.0% respondents eat green salad 1-3 times in a week and 7.5% 4-6 times, whereas 41.5% don’t eat green. In case of fruits, the majority respondents (59.0%) eat 1-3 times in a week. It is also found that majority of the respondents (40.0%) take tea more than 7 times in week. The study reports that about 16.0% respondents don’t eat vegetables for a single time in a week. In case of milk, about 38.5% respondents drink milk 1-3 times in week, whereas 37.5% don’t drink milk for once in a week.

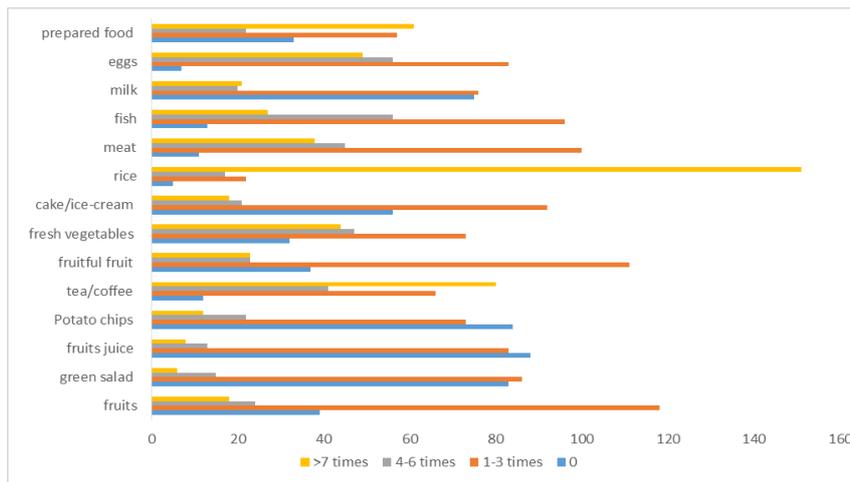


Figure 4: Consumption of food and beverages of the respondents

The Table 5 contains the factors influential food chart of the respondents. It is found that average 36.324 respondents like to make their food chart using types of food choice as prime factor and taste is considered as second influential factor (average 32.944). On the other hand, average 29.200 consider food cost, average 29.024 consider food quality and only average 13.272 consider daily routine.

Table 5: Garratt’s ranking score of the factors influential food chart of the respondents

Influential factors of food chart	Total score	Garrett’s ranking	Average
Types of food choice	9081	1	36.324
Taste	8236	2	32.944
Food cost	7300	3	29.200
Food quality	7256	4	29.024

Daily routine	3318	5	13.272
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Again, in case of food information sources, average 38.884 respondents like to consider doctor’s suggestion as main source (Table 6). On the other hand, internet consider as the second food information sources (average 35.344), family members (average 35.088) as third, TV fourth (average 30.608) but university training (average 13.272) and leaflet (average 13.260) are fifth and sixth respectively.

Table 6: Garratt’s ranking score of food information sources of the respondents

Source of Food Information	Total Score	Garrett Ranking	Average
Doctor	9721	1	38.884
Internet	8836	2	35.344
Family	8772	3	35.088
TV	7652	4	30.608
Varsity training	3318	5	13.272
Leaflet	3315	6	13.260

F. Nutritional Level Measure

From Figure 4 it is found that about 57.0% respondent’s nutritional level are normal and 22.0% and 14.5% are overweight and underweight respectively. On the other hand, only 3.0% respondent’s nutritional level is found obesity.

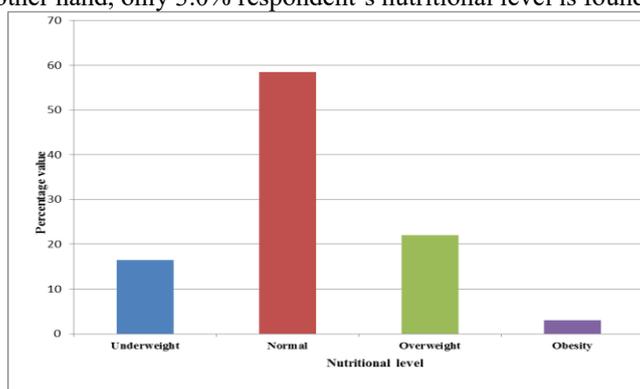


Figure 5: Percentage distribution of the respondent’s nutritional level

G. Determinants the Association of the Socioeconomic, Demographic and Healthy Food Related Factors with Changing Food Habits of Respondents

It is found that about 47.0% male and 27.5% female respondents change eating habits after admission in university and association between sex and eating habits is not significant. In case of religious, it is observed that about 64.0% Muslim and 10.0% Hindu respondent change their eating habits after admission in university. Association between religious and change eating habits is not significant. From Table 7 it is found that about 67.0% respondents come from village, 13.5% Upozila, 10.0% district and only 9.0% divisional city are change their food habit after admission in university. Again, it is found that about 66.5% respondents change eating habit who live without family and only 8.0% who live with family. A significant association has found (p=0.001) between present residence and eating habits after admission in university. Again it reveals that about 46.0% respondents of university hall, 20.0% mess and only 5.0% other residence are change their eating habits respectively and present residence has significant (p=0.001) association with change eating habits.

It is revealed that association between like eating self-cook food and changing eating habits after admission in university significant (p=0.000). A significance (p=0.003) association is found between aware of healthy food and changing eating habits after admission in university. Again it is found that the association of take healthy food with changing eating habits after admission in university is significant (0.000). Again a significant association (p=0.002) is found between changing diet for reducing weight and changing eating habits after admission in university. There is no significant association of awareness of touches food at outside and fatty food with changing eating habits after admission in university.

Table 7: Association of the socio-economic and food choice related factors with changing food habits of the respondents after admission in University

Background Characteristics	Changing eating habits after admission in university			Background Characteristics	Changing eating habits after admission in university		
	No (%)	Yes (%)	Total (%)		No (%)	Yes (%)	Total (%)
Sex				Food prepare together			
Male				1	9.4	43.5	52.9
Female	15.5	47.0	62.5	2-4	7.2	26.1	33.3
	10.0	27.5	37.5		5.1	8.7	13.8

				4+			
Age				Aware of healthy food**			
≥ 22 years				No	1.0	16.5	17.5
22+ years	18.5	45.0	63.5	Yes	24.5	58.0	82.5
	7.0	29.5	36.5				
Religion				Take healthy food***			
Islam	25.0	64.0	89.0	No	5.5	15.5	21.0
Hindu	0.5	10.0	10.5	Yes	16.0	58.5	74.5
Others	0.0	0.5	0.5				
				Cost for food			
Marital Status				≥400.00 Tk	4.6	18.3	22.8
Unmarried	23.0	65.5	88.5	400.00-500.00Tk.	10.7	23.9	34.5
Married	2.5	9.0	11.5	500.00+ Tk.	9.6	33.0	42.6
				Distance of Market			
Permanent residence				≥ 1 km			
Divisional Town	3.0	6.0	9.0	1-2 km	17.7	51.0	68.7
District Town	3.0	7.0	10.0	2 + km	5.6	13.6	19.2
Upozilla Town	4.5	9.0	13.5		2.5	9.6	12.1
Village	15.0	52.0	67.0				
				Change diet to reduce weight**			
Residence with family or not**				No	13.0	38.5	51.5
With Family	8.0	8.0	16.0	Yes	10.5	36.0	46.5
Without Family	17.5	66.5	84.0				
				Aware of touch food at outside			
Present residence**				No	7.0	18.5	25.5
University Hall	11.5	46.0	57.5	Yes	18.5	55.5	74.0
Mess	7.0	20.0	27.0				
Others	1.0	5.0	6.0				
				Aware of fatty food			
Monthly Family Income				No			
Very low	6.8	20.4	27.2	Yes	6.0	20.5	26.5
Low	5.8	19.9	25.7		19.5	53.0	72.5
Medium	4.7	18.3	23.0				
High	8.4	15.7	24.1				
				Allergies for food			
Eating Place*				No	11.0	38.0	49.0
Canteen	3.5	14.5	18.0	Yes	14.5	36.0	50.5
Self-cook	7.5	31.0	38.5				
Hotel/restaurant	2.5	11.0	13.5				
Home	11.0	16.0	27.0				
				Avoid salty food			
Eating self-cook food***				No	8.0	19.5	27.5
No	12.0	34.5	46.5	Yes	17.5	55.0	72.5
Yes	11.0	40.0	51.0				

Note: level of significance, *** indicate 0.000; ** indicate 0.005 and * indicate 0.05' Very low= >11000.00 Tk., Low= 11000.00-20000.00 Tk., Medium= 20001.00-30000.00 Tk. and High= 30001.00= Tk.

V. DISCUSSION

A large number of students comes from different regions of Bangladesh and gathers together for educational purposes in Rajshahi University. It is known that different regions and religion habituated with different types and tested of food but after admission in university they need to change food types and behavior. For this reason, they face big trouble to adjust or maintain good health in University. Moreover, University atmosphere and freedom of food choice influence on their change eating habits that may impact on health. The present study intends to investigate the factors influencing changing eating habits of the University students. Study findings suggest that some of the students are not able to maintain time for taking breakfast, lunch and dinner after admission in University. It may be due to stay far from their family, different life style in University, living with friend and availability of favorable types of food and unable to manage time to eat and similar with previous studies (Kabir, et al., 2018; Bagordo, et al., 2013). There are several factors like University characteristics, physical environment, social environment, individual characteristics and living away from home are responsible for adoption of unhealthy outside food among University students. Present study also reveals that eating outside unhealthy food behavior has increased among a large number of the students after admission in University and it similar with previous study (Diez, et al., 2009; Johansen, et al., 2006; Deliensi, et al., 2014). In concordance with the previous studies (Johansen, et al., 2006; Deliensi, et al., 2014; Kabir, et al., 2018), the present study shows that most of the students are aware for their eating habits and food intake nevertheless, a large number of students are not able to maintain their proper and healthy dietary chart because of numerous trouble like exams, University lifestyle, students society, distance of market cost of food and so on. From the analysis of this study, it is found that students residence with family or not,

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present residence, eating place, eating self-cook food, aware of healthy food and change diet to reduce weight have significant association with changing eating habits after admission in University.

VI. CONCLUSION

The present study represents an important step toward understanding the factors influence on changing eating habits among the University student's. Study finds that the majority respondents' weight is normal. It provides that most of the respondents take healthy food and like to change food habits with necessity for reducing weight. It is also found that food choice of the respondents has influences on making food chart and the main source of food information is doctor. It is also found that the respondents prefer healthy food like vegetables, green salad, eggs, milk and so on for maintaining their good health during University study life. Changing food consumption behavior and food choices is an important matter for maintaining good health during university study period of a student. It is observed from the study that university atmosphere (residency, exams, etc.) influence the changing eating behavior of the students. Therefore, authority should take initiative for multi-level intervention programs aiming to improve healthy eating behaviors of university students. Lastly, University authority should check food quality, availability of healthy food and hygienic environment of food making and providing places of inside university campus like hall dining, canteen, university cafeteria and floating restaurants on regular basis.

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Gender Perception in Accounting Lives

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DOI: 10.29322/IJSRP.10.09.2020.p10536
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10536>

Abstract- Not all women can be independent in living their lives, this could be because women experience dependency, fear of independence and have a deep desire to be cared for and protected by others. As explained earlier, socio-cultural influences cause women to be educated, nurtured and raised by conditioning them as weak creatures, thus creating dependence. Cinderella complex is a form of psychological phenomenon that is not widely known by the general public. Cinderella Complex talks about the independence that psychologists experience in women. One of the increasing roles of women in society can be seen from the variety of jobs currently occupied by women. The field of science is not beyond the reach of women, as evidenced by the large number of auditors, financial managers and financial staff for professions that are normally synonymous with the work of men occupied by women. This research is a descriptive study, so there are no dependent and independent variables, the variable in this study is the cinderella complex variable for female workers who majored in accounting at Mahardhika College of Economics in Surabaya. The Cinderella complex for female students majoring in accounting at Mahardhika College of Economics Surabaya is in the medium category, which means that the fear of independence is not too heavy. The complex aspect of cinderella that has the biggest obstacle is the passive aspect of making decisions and developing oneself and the one that has the smallest contribution is the tendency to rely on others.

Index Terms- behavioral accounting, cinderella complex and female workers.

I. INTRODUCTION

In this life, man consists of two sexes, male and female. Men are better known as leaders, protectors, role models, strong and character in the world of work, while women are better known as gentle, fragile, affectionate, want to be protected, shy and obedient. In social life the position of women is not the same as men, although efforts have been made for a long time. Socio-cultural factors place women lower than men. In accordance with the times, the role of women today is quite large in various aspects of life. One of the increasing roles of women in society can be seen from the variety of jobs currently occupied by women. The field of science is not beyond the reach of women, as evidenced by the large number of auditors, financial managers and financial staff for professions that are normally synonymous with the work of men occupied by women. In fact, not all women can be independent in living their lives, this could be because women experience dependence, fear of independence, and have a deep desire to be cared for and protected by others. As explained earlier,

socio-cultural influences cause women to be educated, nurtured and raised by conditioning them as weak creatures, thus creating dependence (Anggriany and Astuti, 2003).

Cinderella complex is a form of psychological phenomenon that is not widely known by the general public. Cinderella Complex talks about the independence that psychologists experience in women. One of the causes of the Cinderella Complex tendency is gender differences in society. This difference in gender treatment leads to differences in the nurture between women and men, as well as the culture of male domination of women in family and society. The difference in parenting is evident when the family and environment provide more comfort for women than men. Families and the environment educate men to learn to deal with their own problems and not whiny, while women are left whiny and tend to get help from others when facing problems (Dowling, 1981). Based on the description of the Cinderella Complex above, the researchers are interested in further researching the Cinderella Complex on the staff of financial in Surabaya.

II. LITERATURE REVIEW

Behavioral Accounting

Accounting is a science that is always developing. The development of accounting is in line with the development of the business world today. In its development, accounting has a role in producing financial and non-financial information that is used by users in the business decision making process. Accounting can not be separated from aspects of human behavior and organizational needs for information that can be generated by accounting. Behavioral accounting is the relationship between accounting and social science. Behavioral accounting is one area of accounting that connects human behavior with information systems whose scope includes financial accounting and management accounting. Behavioral accounting discusses how human behavior influences accounting information and business decisions and how accounting information influences human behavior and business decisions (Supriyono, 2016). The cultural aspect of accounting is also called behavioral accounting. Various cultures can influence the role or outcome of interactions between accounting information and consumer or presenter behavior. Relating to the relationship between human behavior and accounting systems in the fields of financial accounting, auditing and management accounting. This is also considered a specialized field of accounting (Siegel et al, 1989). Behavioral accounting scope is the application of behavioral science concepts to the design and preparation of accounting systems, studies of human reactions to the format and content of financial statements, how to process

information for decision making, the development of reporting techniques to communicate behavioral information to its users and the development of strategies to motivate and influence behavior, aspirations and goals of people who manage organizations (Supriyono, 2016).

Cinderella Complex

Cinderella Complex is a popular psychological theory expressed by Dowling based on Honey's psychoanalytic theory, especially women. The Cinderella complex speaks of women's fear of independence. Women tend to be unsure of their own abilities and depend on others, especially those who are stronger than themselves to care for and protect themselves. Cinderella Complex is defined as fear that makes women depressed so that they can utilize their potential, talents and creativity optimally (Dowling, 1981). Cinderella Complex causes women to tend to depend on others who are stronger than themselves and become independent. Most women hate their dependence on others and want independence. Want to be free from the domination of family and men with the status of husband or employer, free to make their own decisions and free to determine what career and profession will be undertaken. The desire to be independent is hampered by feelings of inferiority or lack of trust in one's own abilities (Dowling, 1981). Some of the factors that cause Cinderella Complex in women are care in the family environment (child care for the first six years, child care patterns that are not gender oriented, the need for love that is not fulfilled during childhood and the dominance of parents) and treatment in society (providing excessive assistance and protection to women, stereotyping women as second-class people in society, independence as non-feminine behavior and differences in gender treatment in social life). Some aspects of the Cinderella Complex are low self-esteem, fear of losing womanhood, high external locus of control, passivity in making decisions and developing themselves and a tendency to rely on others (Dowling, 1981).

Previous research

Some studies that have been carried out by previous researchers related to Cinderella Complex are:

1. Zain (2016) the results of his research are based on the perspective of psychoanalysis, Cinderella Complex occurs when women feel inferior not because of the internalization and socialization of gender from their environment. In the perspective of gender development, the Cinderella Complex in women is influenced by local culture that prepares women as weak creatures and unable to become independent creatures.
2. Hapsari, et al (2014) in their study showed that in general the Cinderella Complex in UNS students was in the moderate category. This means that the fear of freedom experienced by female students at UNS is not too heavy. The most prominent aspect of the Cinderella Complex for female students at UNS is that it expects direction from others and what is not prominent is dependency on others.
3. Oktinisa et al (2017) showed the results that researchers found that there were no significant differences in the tendency of the Cinderella complex in terms of parental perception, in general the Cinderella complex tendency

was very low, finding the most authoritative parenting style. childcare.

4. Su and Xue (2010) the conclusion is that more and more people are aware of the Cinderella Complex phenomenon, so that we can find paradigms, especially in women. Its existence reveals the unfair treatment of women so far.
5. Sofia et al (2017) found that there was a decrease in the level of Cinderella Complex in Communication Science students at Mulawarman University after being given a one-hour treatment rule and there was no decrease in the level of cinderella complex in Communication. Students study at Mulawarman University who are not given the one-hour treatment rule.
6. Zahrawaany et al (2019) shows the results that the research hypothesis is accepted, which can be interpreted that there is a significant negative influence between personal maturity and the tendency of the Cinderella Complex in early adult women. This shows the negative influence between personal maturity and the fearful behavior of women to be independent and explore themselves.

III. RESEARCH METHODS

This research is included in quantitative research with a percentage of descriptive research design. The presentation in this study is frequency and percentage (using frequency tables and graphs to provide clarity and understanding of the situation presented (Azwar, 2003). This research is a descriptive study, so there are no dependent variables and independent variables, the variables in this study are variables Cinderella complex in female workers who majored in accounting at the Mahadhika School of Economics, Surabaya. Operational definitions in this study are low self-esteem (related to women's emotions), tendency to rely on others, passive in making decisions and developing themselves, locus of control high external (related to women's emotions) and fear of losing femininity (related to women's cognitive aspects). The sampling technique used in this study was purposive sampling (Arikunto, 2002) with the condition that female workers who majored in accounting, were older than 20 years un and experience the cinderella complex.

Analyzing data is important in research, the data obtained is then processed further to provide information that can be understood. Knowing about the Cinderella Complex specifically, can be done as follows:

- a. Descriptive statistics with SPSS
- b. Calculate the highest score (number of items x highest item value)
- c. Calculate the lowest score (number of items x lowest item value)
- d. Theoretical Mean (number of items x 2.5)
- e. Calculate standard deviation ((highest score - lowest score): 6)
- f. Specify categories (high, medium and low)
- g. Determine the percentage

IV. RESULTS

Cinderella complex descriptive results based on empirical mean aspects in it, can be seen in the table below:

Table 1. Detailed description of cinderella complex

The Cinderella Complex aspect	Category		
	High	Medium	Low
Low self-esteem	11%	72%	17%
Tendency to rely on others	13%	59%	28%
Passive in making decisions and developing themselves	21%	61%	18%
High external locus of control	12%	72%	16%
Fear of losing femininity	11%	73%	16%

Source: processed data

Based on the results obtained show that aspects of the cinderella complex consisting of low self-esteem, tendency to rely on others, passivity in making decisions and developing themselves, high external locus of control and fear of losing femininity in this case to female workers who majored in accounting at STIE Mahardhika Surabaya is in the medium category.

Table 2. Results of a description of cinderella complex

The Cinderella Complex aspect	Hypothetical Mean	Empirical Meaning	Number of Items	Mean Per Aspect
Low self-esteem	17.5	17.2	7	2.45
Tendency to rely on others	17.5	16.6	7	2.36
Passive in making decisions and developing themselves	12.5	12.7	5	2.54
High external locus of control	17.5	17.1	7	2.43
Fear of losing femininity	17.5	17.2	7	2.46

Source: data processed

The Cinderella complex for female workers majoring in accounting at Mahardhika School of Economics Surabaya consists of several aspects, namely low self-esteem, a tendency to rely on others, passivity in making decisions and developing themselves, high external locus of control and fear of losing femininity. The results of calculations per aspect are in accordance with table 2. The results of calculations per aspect produce aspects that have the most constructive passive aspects in making decisions and developing oneself and which has the smallest contribution is the tendency to rely on others.

V. CONCLUSION

Cinderella complex is an unconscious desire to be treated by others, because of the fear of independence that is largely depressed so that women cannot and do not dare to take full advantage of their abilities and creativity. Whereas the Cinderella complex in female workers is psychological dependence that is indicated by a strong desire to be cared for and protected by others, especially men, and the belief that something from the outside will help, this happens to women over the age of 20 years and is being developed. themselves by studying. The Cinderella complex for female students majoring in accounting at Mahardhika College of Economics Surabaya is in the medium category, which means that the fear of independence is not too heavy. The complex aspect of cinderella that has the biggest obstacle is the passive aspect of making decisions and developing oneself and the one that has the smallest contribution is the tendency to rely on others.

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Effectiveness of Selected Nursing Interventions on Specific Symptoms among Cancer Clients Undergoing Radiation Therapy in Oncology Department Government Rajaji Hospital, Madurai

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DOI: 10.29322/IJSRP.10.09.2020.p10537

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10537>

Abstract- The aim of the study to evaluate the effectiveness of selected nursing interventions on specific symptoms among cancer clients undergoing radiation therapy in oncology Department Government Rajaji Hospital, Madurai. Objectives : The main objective was to evaluate the effectiveness of selected nursing interventions on specific symptoms among clients undergoing radiation therapy. Conceptual framework : The conceptual framework for this study was based on Wiedenbach's Helping Art of Clinical Nursing Theory. Design : True experimental – Pretest Post Test design. Clients were selected using simple random sampling method. Setting of the study : The study was conducted in oncology department of Government Rajaji Hospital, Madurai Subjects: A total of 60 subjects were included in the study out of which 30 were in experimental group and 30 in control group received to intervention. Main outcome measure: pre and post test was conducted by using standardized memorial symptoms assessment scale before and after intervention. Findings: The mean pretest value for experimental group 5.9 and The mean post is value is 2.76 and it is highly significant at the level of $p < 0.001$. Conclusion: The study concluded that selected nursing intervention like giving lemon juice and orange is effective in reducing the symptoms of radiation therapy among the cancer cervix clients.

Cancer cervix turns out to be the most common cancer among females of age of 35 -45 years. This is the most common cancer that affects Indian women. Worldwide, cervical cancer is the third most common type of cancer in women. It is much less common in the United States because of the routine use of Pap smears. Cervical cancers start in the cells on the surface of the cervix. There are two types of cells on the cervix's surface: squamous and columnar. Most cervical cancers are from squamous cells. Cervical cancer usually develops very slowly. It starts as a precancerous condition called dysplasia. This precancerous condition can be detected by a Pap smear and is 100% treatable. It can take years for precancerous changes to turn into cervical cancer. Most women who are diagnosed with cervical cancer today have not had regular Pap smears or they have not followed up on abnormal Pap smear results. Almost all cervical cancers are caused by HPV (human papilloma virus).

HPV is a common virus that is spread through sexual intercourse. There are many different types of HPV. Some strains lead to cervical cancer. (Noller KL.et.al [2007])

Radiation oncology is the medical specialty concerned with prescribing radiation, and is distinct from radiology, the use of radiation in medical imaging and diagnosis. Radiation may be prescribed by a radiation oncologist with intent to cure ("curative") or for adjuvant therapy. It may also be used as palliative treatment (where cure is not possible and the aim is for local disease control or symptomatic relief) or as therapeutic treatment (where the therapy has survival benefit and it can be curative). It is also common to combine radiation therapy with surgery, chemotherapy, hormone therapy, immunotherapy or some mixture of the four. Most common cancer types can be treated with radiation therapy in some way. The precise treatment intent (curative, adjuvant, neoadjuvant, therapeutic, or palliative) will depend on the tumor type, location, and stage, as well as the general health of the patient. Total body irradiation (TBI) is a radiation therapy technique used to prepare the body to receive a bone marrow transplant

I. NEED FOR THE STUDY

The World has a population of 2329.08 million women ages 15 years and older who are at risk of developing cervical cancer. Current estimates indicate that every year 493,243 women are diagnosed with cervical cancer and 273,505 die from the disease. Cervical cancer ranks as the 2nd most frequent cancer in women in the World, and the 2nd most frequent cancer among women between 15 and 44 years of age. About 10.0% of women in the general population are estimated to harbour cervical HPV infection at a given time, and 70.1% of invasive cervical cancers in the World are attributed to HPV16 or 18. (National health system project, Tamilnadu, 2012)

Radiation therapy is commonly applied to the cancerous tumor because of its ability to control cell growth. Ionizing radiation works by damaging the DNA of exposed tissue leading to cellular death. To spare normal tissues (such as skin or organs

which radiation must pass through to treat the tumor), shaped radiation beams are aimed from several angles of exposure to intersect at the tumor, providing a much larger absorbed dose there than in the surrounding, healthy tissue. Besides the tumour

1.3 OBJECTIVES:

1. To assess the severity of specific symptoms for clients with cancer cervix undergoing radiation therapy among experimental and control group.
2. To evaluate the effectiveness of selected nursing interventions on specific symptoms among Clients undergoing radiation therapy in experimental group.
3. To associate the post test scores of cancer with selected demographic and clinical variables among experimental and control group.

1.4 HYPOTHESIS

H1 There will be significant difference in severity of specific symptoms before and after selected nursing interventions among experimental group .

H2 There will be a significant association between the post test scores with selected demographic and clinical variables among the Clients in experimental group.

2.1 LITERATURE RELATED TO ASSESSMENT OF THE SYMPTOMS CANCER CLIENTS UNDERGONE RADIATION THERAPY.

Murphy BA, Gilbert J. (2009) conducted a study among head and neck cancer Clients treated within 4 to 5 weeks of radiation therapy to assess dysphagia and other symptoms. results show that Clients develop mucositis, radiation dermatitis and edema of soft tissue , pain, copius mucous production, xerostomia and tissue swelling contribute to acute dysphagia , further it reveals that as the acute effects resolve late effects including fibrosis, lymph edema and damage to neural structures become manifest. Hence the researcher concluded that early referral for evaluation by speech language pathologist is critical to ensure adequate assessment of swallow function and a treatment plan was generated that includes patient education and swallow therapy.

Vistad I, Cvancarova M, Fossa SD, Kristensen GB. (2008) conducted a study on Post radiotherapy morbidity in long-term survivors after locally advanced cervical cancer among 147 Cervical Cancer survivors treated between 1994 and 1999 at The Norwegian Radium hospital, data was collected by a questionnaire and results revealed that reduced morbidity had reduced by 91 (62%) after a median follow-up time of 96 months (65-131 months). The results were compared with physician-assessed morbidity scores recorded at 5 years, and to selected normative data using descriptive statistics. Stress incontinence, diarrhea, nausea, and sexual problems were significantly ($p < 0.001$) more prevalent when compared with a control sample from the general female population.

2.2 LITERATURE RELATED TO SYMPTOM MANAGEMENT OF CLIENTS UNDERGONE RADIATION THERAPY.

John A Green.et.al, (2012) conducted a study concomitant chemotherapy and radiation therapy for cancer of the uterine cervix. Meta analysis with randomized controlled trails (RCTS). 24 trials and 4921 Clients, although due to patient exclusion and differential reporting 61% t 75% were available for the analyses. Whether or not platinum was used with absolute benefits of 10% and 13% respectively. There was, however, statistical heterogeneity for this outcome. There was some evidence that the effect was greater in trials including a high proportion of stage I and II Clients. Chemoradiation also showed significant benefit for local recurrence and suggestion of benefit for distant recurrence. Acute hematological and gastrointestinal toxicity was significantly greater in the concomitant chemoradiation group.

Benze G, Alt-Epping B, Geyer A, Nauck F. (2012) conducted a systemic review to assess Treatment of nausea and vomiting with prokinetics and neuroleptics in palliative care Clients to determine the level of evidence for the treatment of nausea and vomiting with prokinetics and neuroleptics in palliative care Clients suffering from far advanced cancer and no longer being treated with chemotherapy,a total of 30 studies fulfilling the inclusion criteria were found. All studies focused on cancer Clients. The study showed that metoclopramide is seen as an effective drug in many studies whereas the evidence for it is moderate at best. Within the group of neuroleptics, levosupiride and levomepromazine seem to have good antiemetic potential but the evidence level is low in Clients with advanced cancer, hence metoclopramide can be used to reduce nausea and vomiting for these clients.

II. CONCEPTUAL FRAMEWORK

The conceptual framework for research study serves as a measure on which the purpose of the study is based. It also serves as a springboard for theory development. The framework provides the prospective from which the researcher views the problem under investigation.

The investigator adopted the Wiedenbach's Helping Art of Clinical Nursing theory (1964) as a base for developing the conceptual framework. This theory directs an action towards an explicit goal. It has 3 factors

1. Central purpose
2. Prescription
3. Realities

1. Central purpose

It refers to what the nurse wants to accomplish. It is the goal towards which a nurse strives. In this study the main central purpose is to assess the effectiveness of selected nursing interventions on specific symptoms among Clients undergoing radiation therapy in oncology department, Government Rajaji Hospital, Madurai.

2. Prescriptions

It refers to plan a care for a patient. It will specify the nature of action that will fulfill the nurse's central purpose. In this study the investigator plans to provide the nursing intervention among patient who receiving radiation therapy and assess the improvement of the symptoms.

3. Realities:

It refers to the physical, physiological, emotional and spiritual factors that affect the nursing action. The five realities identified by Wiedenbach's theory are agent, recipient, goal, means and activities and framework. The conceptualization of nursing practice according to this theory' consists of 3 steps as follows

- Step-1: Identifying the need for help.
- Step-2: Ministering the needed help.
- Step-3: Validating the help.

Step-I: Identifying the need for help.

This step involves determining the need for help assessment of the symptoms MSAS scale (Memorial Symptom Assessment Scale) among cancer cervix Clients receiving radiation therapy by means of pretest questionnaire.

Step-2: Ministering the needed help.

This step involves provision of required help for identified need. It has 2 components

Prescription: It refers the investigator nursing intervention (lemon juice, Orange juice) undergone specific symptoms like nausea vomiting and loss of appetite among cancer cervix patient receiving radiation therapy.

(i) **Realities:** In this study', the five realities identified by Weidenbach theory are

- Agent: Investigator
- Recipient: cancer cervix receiving radiation therapy
- Goal: Reduced of the symptoms (nausea vomiting, appetite stimulate) receiving radiation therapy.

• Means:

- o Experimental group- Nursing intervention (Lemon juice and orange)
- o Control group - No intervention

Step: 3 validating that the need for help was met.

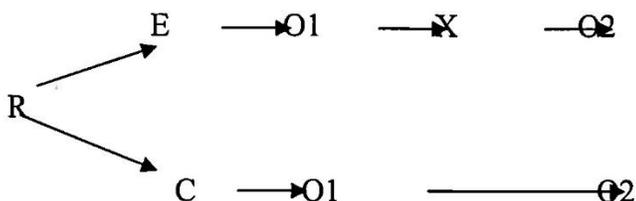
The nurse validates the ministered help. It is accomplished by means of post test symptoms assessed by MSAS scale for experimental group reduce the symptoms and control group there is no changes in symptoms.

**3.14 RESEARCH APPROACH
QUANTITATIVE APPROACH**

The research approach used for this study was quantitative approach. An experimental study was adopted because investigator used randomization and manipulation in the form of nursing intervention to experimental group and regular care treatment for control group.

3.2 DESIGN:

True experimental — Pretest Post test design.



3.3 RESEARCH VARIABLES

Independent variable: Selected nursing intervention
Dependent variable: Specific symptoms among Clients undergoing radiation therapy
Demographic variable: Age, educational status, income, occupation,
Clinical variable: Hemoglobin level, blood pressure, duration of illness, number of radiation sitting.

3.11 SCORING PROCEDURE

Part - I It includes age, education, occupation, and monthly income, duration of illness, hemoglobin level blood pressure, duration of illness, number of radiation sitting. Descriptive statistics like number, percentage used for analysis.

Part - II Each symptoms frequency as it occurred was rated as • Rarely-1 • Occasionally - 2 • Frequently — 3 and • Almost constantly — 4 Interpretation of Scores • 2 to 4 -Mild Symptoms • 4 to 6- Moderate Symptoms • 6 to 8- Severe Symptoms) 3.12

CONTENT VALIDITY:

The tool used for this study was given to five experts in the filed of nursing and medicine for content validity. Suggestions were considered and appropriate changes were made and found to be valid.

RELIABILTY:

The Memorial Symptom Assessment Scale (MSAS) is a multidimensional tool developed to evaluate measure the prevalence, characteristics and distress of common symptoms related to cancer. The author who invented this tool has conducted a study to evaluate its reliability and validity ,One hundred-twenty Clients were included in

3.11 SCORING PROCEDURE

It includes age, education, occupation, and monthly income, duration of illness, hemoglobin level blood pressure, duration of illness, number of radiation sitting. Descriptive statistics like number, percentage used for analysis.

Each symptoms frequency as it occurred was rated as

- Rarely-1
- Occasionally - 2
- Frequently — 3 and
- Almost constantly — 4 Interpretation of Scores
- 2 to 4 -Mild Symptoms
- 4 to 6- Moderate Symptoms
- 6 to 8- Severe Symptoms)

3.13 PILOT STUDY

The pilot study was conducted among the cancer cervix Clients receiving radiation therapy in oncology department, samples were selected from the selected population after obtaining the permission from the subjects. Pilot study was from 01.08.2012 to 07.08.2012. Clients selected for the pilot study were not included for the main study. Pilot study revealed that the study was feasible.

3.14 DATA COLLECTION PROCEDURE

Data collection was done for the period of 4 weeks. Clients were selected by simple random sampling. Data was collected on all days from 8 am to 5 pm. the period for data

collection was from 16.08.2012 to 15.09.2012. Each week twenty samples were selected by simple random sampling, out of which 10 were in experimental group and 10 were in control group and pretest assessment of was done using MSAS on day '1' and selected nursing intervention of giving 200ml of lime juice+ one cricket ball size orange fruit was administered only to experimental group, and the control group received regular treatment. Same intervention was carried for consecutive 6 days and on the next day post test was conducted for both experimental and control group using the same MSAS. The same procedure was followed for the next two weeks.

III. DATA ANALYSIS AND INTERPRETATION

Analysis is the appraisal of the data and interpretation of the data consisting of relation between findings of the study to the research problem and theoretical framework for the study. An important function of the research problem and theoretical framework for the study. This chapter deals with analysis and interpretation of the data collected of specific symptoms with selected nursing intervention among cancer Clients receiving

radiation therapy. From 60cancer cervix who receiving radiation thearaphy, 30 for experimental and 30 for control group being analyzed classified and tabulated on the basis of the objectives of the study.

PRESENTATION OF THE DATA

The study findings of the samples are presented in the following sections.

Section-A: Distribution of demographic and clinical variables of the client's with Cancer cervix receiving radiation therapy.

Section-B: Frequency, mean, standard deviation, mean percentage of the client's with Cancer cervix receiving radiation therapy.

Section-C: Effectiveness of selected nursing interventions on specific symptoms among Clients undergoing radiation therapy in experimental group and control group.

Section-D: Association of post test score with selected demographic and clinical variables in both experimental and control

Frequency and percentage wise distribution of patient under radiation therapy in Oncology department in both experimental and control group (n=30)

DEMOGRAPHIC VARIABLE	Control Group		Experimental Group	
	f	%	f	%
Age (IN Year):				
(a). 30-40	-	-	1	3
(b). 41-50	20	67	19	63
(c). 51-60	10	33	10	33
(d). 61-70	-	-	-	-
Educational Status:				
(a). No formal education	28	93	29	97
(b). Primary	2	7	1	3
(c). Higher education	-	-	-	-
(d). Graduate and others	-	-	-	-
Occupation:				
(a). coolie	22	73	29	97
(b). Agriculture	6	20	-	-
(c). Business	2	7	1	3
(d). Private employee	-	-	-	-
Family income:				
(a). Rs.< 500	22	73	-	-
(b). Rs.501 - 1000	6	20	-	-
(c). Rs.1001 – 2000.	2	7	23	77
(d). Rs.>2001	-	0	7	23

DEMOGRAPHIC VARIABLE	Control Group		Experimental Group	
	f	%	f	%
CLINICAL VARIABLE				

Hemoglobin levels (gms%):				
(a). 9	-	-	1	3
(b). 9.5	2	7	1	3
(c). 10	26	87	15	50
(d). 10.5	1	3	1	3
(e). 11	1	3	11	37
(f). 11.5	-	-	1	3
Duration in years:				
(a). Less than or equal to 1 year	29	97	22	73
(b). 2-5 years	-	-	8	27
(c). More than 5 years	1	3	-	-
Blood Pressure:				
(a). > or = 130/90 mm hg	-	-	-	-
(b). < 130/90 mm hg	30	100	30	100
Radiation sitting:				
(a). 12-15	12	40	2	7
(b). 16-19	18	60	20	67
(c). 20-23	-	-	8	26

With regard the age out of 30 samples of experimental group 19 (63%) of them belongs to age group 41 - 50 years, 10(33%) of them belongs to 51 -60years, 1(3%) persons belongs to age group 30 -40years and none of the age group of 61 - 70years. With regard the age out of 30 samples of control group 20 (67%) of them belongs to age group 41 - 50 years, 10(33%) of them belongs to 51 -60years, 1(3%) persons belongs to age group 30 -40years and none of the age group of 61 -70years.

LEVEL OF SYMPTOMS FOR PRETEST & POST TEST IN EXPERIMENTAL GROUP

According to the educational status out of 30 samples of experimental group 29 (67%) of them belongs to no formal education, 1(3%) of them belongs to primary education, and none of the education status of Higher education and Graduate and others. With regard the educational status of 30 samples of control group 28 (93%) of them belongs to no formal education, 2(7%) of them belongs to primary education, none of the educational status for higher education and graduate and others.

FIG .7. Percentage wise distribution of level of symptoms for both pretest and post test in experimental group.

The figure shows that in experimental group the severe of symptoms has decreased and number of Clients in severe symptoms had reduced from 10% to 0% and most of then had came down to mild symptoms.

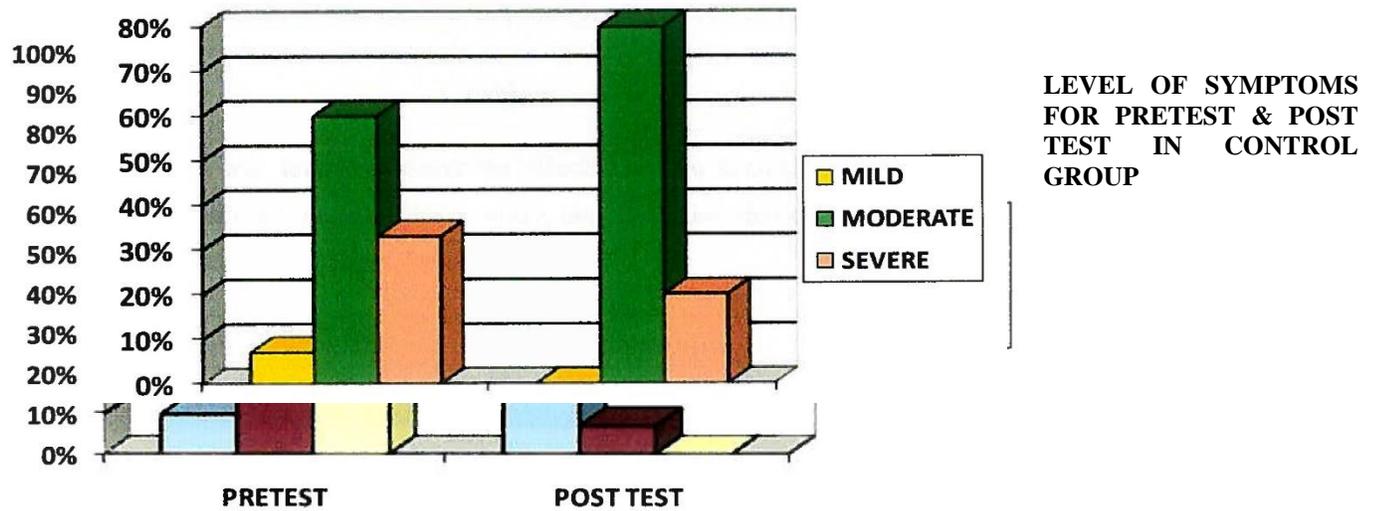


FIG. 8. Percentage wise distribution of level of symptoms for both pretest and post test in control group.

The figure shows that in control group the level of symptoms remain almost same in both pretest and post test, in pretest 60% were in moderate symptoms and in post test 80% were in moderate symptoms.

Effectiveness of selected nursing interventions on specific symptoms among Clients undergoing radiation therapy in experimental group and control group.

Table-4

Paired "t"-test was found to assess the effectiveness to symptoms on selected nursing interventions among Clients undergoing radiation therapy in Oncology department within experimental group.

*-P<0.05, significant and **-P<0.01 &***-P<0.001, highly significant

	Post test		Pre test		't'-value	P-value
	Mean	SD	Mean	SD		
Overall	2.76	0.43	5.9	1.18	13.41	0.000***

Table-5

Paired "t"-test was found among Clients undergoing radiation therapy in Oncology department within the control group.

*-P<0.05, significant and **-P<0.01 &***-P<0.001, highly significant

This table reveals that in experimental group, posttest level of nursing intervention mean (2.76) is reduced from pretest mean 5.9 which is highly significant at 0.000*** level.

There was no significant change in mean comparing in control group pre and posttest level of symptoms.

	Control pretest test		Control Post test		't'-value	P-value
	Mean	SD	Mean	SD		
Overall	6.3	1.27	5.9	0.803	1.459	0.10

6.1 SUMMARY

Cancer is one of the common non communicable diseases. It is 'silent killer disease'. It is the time that we have to focus on the health care facilities and comprehensive treatment for cancer at maximum level.

Cancer is the chronic disease the long term treatment of them alters the behavioral pattern of the client. The health care providers play vital role to educate the population about the importance of early detection, treatment and prevention of its complication. Hence "A study to evaluate the effectiveness of selected nursing interventions on specific symptoms among cancer clients under radiation therapy in Oncology department, at Government Rajaji Hospital, Madurai" was undergone to see the effectiveness.

The study was done on sixty clients based on the inclusion criteria and data was collected through simple randomized (lottery method). 30 clients for experimental group 30 control group in oncology department.

6.3 CONCLUSION

Consuming lemon juice and orange is effective and feasible. It is low cost method to decrease the nausea and vomiting, food taste changes. A Cancer cervix client with receiving radiation therapy is influenced by the demographic and clinical variables. Based on the methods of sample selection, the finding may be generalized to an individual with cancer cervix client. the study findings provides the statistical evidence which early indicates that lemon juice and orange is one of the best alternative therapy which may be used in reduction of the symptoms for the cancer cervix clients receiving radiation therapy. Symptom will be reduced highly significant among the clients who received lemon juice and orange. The result suggested that association between the post test measures of symptoms level in the demographic variables.

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Effects Of HIV Oral Pre-Exposure Prophylaxis On Incidence Of STIs Among Female Sex Workers In Selected Drop-In Centers In Nairobi County.

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DOI: 10.29322/IJSRP.10.09.2020.p10538

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10538>

Abstract

Pre-exposure Prophylaxis (PrEP) is effective in prevention of Human Immunodeficiency Virus (HIV) infections among populations at a substantial risk. World Health Organization recommends use of PrEP for prevention of HIV, however, risk of sexually transmitted Infections (STIs) raises concern. While STIs screening is continually done at PrEP refill visits and cases treated, increased risk of STIs may reduce the prevention benefits of PrEP while increasing STI rates with ultimate impact on economic and health burdens. This study investigated the effects of HIV oral PrEP on the incidences of STIs and risky sexual behaviours among female sex workers in Nairobi. Specifically, the study; compared the incidence rate of bacterial STIs and identified the STIs between FSWs taking HIV oral PrEP and non-PrEP user FSWs in Nairobi. A six months retrospective cohort study was conducted among FSWs comprising of both HIV oral PrEP users and non-PrEP users accessing services at selected Drop-in Centres (DICEs) in Nairobi County. Multi stage sampling was employed to select Sub Counties, DICEs and participants, to generate a sample size of 168 PrEP users and 168 non-PrEP users. A structured data abstraction tool was used to collect data on STI incidences. Data was analysed using STATA. Oral PrEP users were found to be 1.7 times higher risk of acquiring STIs ($P=0.064$, 95%CI) than non-PrEP users. Vaginitis (52.1%) and cervicitis (21.8%) were the most common STIs identified among FSWs. Composite STI prevalence of 35.4 and pooled STI incidence rate of 70.8 per 100-person years was observed. This study demonstrated an increasing trend of STIs among FSWs using HIV PrEP; 0%, 7%, 13%, 16%, and 21%, from enrolment to month five, with the most notable STIs being vaginitis, cervicitis and Pelvic Inflammatory Disease (PID). Oral PrEP use does not increase STI risk, however there was a notable increasing trend of STI cases through the six-month study period. STIs prevention counselling should therefore be emphasized during PrEP initiation and throughout PrEP follow up visits.

Index Terms: Drop In Centres, Female Sex Worker, HIV, Pre-Exposure Prophylaxis.

Background

Oral Human Immunodeficiency Virus (HIV) Pre Exposure Prophylaxis (PrEP) is a chemoprophylaxis involving use of antiretroviral medicines to prevent HIV (Grant *et al.*, 2010). Oral PrEP can reduce the risk of HIV infection by more than 95% among men who have sex with men (MSM) with solid medication adherence (Jenness, Weiss, *et al.*, 2017). Oral PrEP has been adopted globally for prevention of HIV among the populations at substantial ongoing risk of HIV (WHO, 2015). In Kenya, oral PrEP was launched in 2016 (NASCO, 2017). Pre Exposure Prophylaxis (PrEP) intervention has become crucial among Female Sex Workers (FSW) as a result of their increased risk to acquire HIV due to multiple sexual partners (Shannon *et al.*, 2015). Increased incidence of STI has been observed in demonstration studies with some studies recording up to 50% of men initiated on PrEP presenting with STIs (Jenness, Weiss, *et al.*, 2017), (Liu *et al.*, 2016). Oral PrEP is a major biomedical approach towards HIV control (Gabona *et al.*, 2017) (Pyra *et al.*, 2019). Combination of Tenofovir disoproxil Fumarate and Emtricitabine (TDF/FTC) reduce HIV-1 infection by up to 75% (Thigpen *et al.*, 2012). The use of oral HIV Pre Exposure prophylaxis has demonstrated a significant reduction in HIV infection (McCormack *et al.*, 2016).

Populations have been categorized based on their risky behaviours and vulnerabilities to acquiring HIV. Key populations are distinct groups who are at high risk of acquiring HIV infection due to their high risk behaviour and include; people in prison and other closed settings, Men who have sex with men, persons who inject drugs, sex workers and transgender people (World Health Organization, 2014). These risky behaviour and vulnerabilities determine the dynamics of HIV epidemics (Beyrer, 2016). Global HIV prevalence among Sex Workers is estimated to be 12% while in countries with medium and high HIV prevalence in the

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10538>

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general population, the HIV prevalence among sex workers is over 30% (Beyrer, 2016). Over 300,000 people have been initiated on PrEP since 2012, however, small proportion of these are female (Hodges-Mameletzis *et al.*, 2019), while Female sex workers are disproportionately at risk of HIV (Shea *et al.*, 2019).

Users of HIV Pre-Exposure Prophylaxis have up to 20 times higher rates of STI infections than in HIV seronegative gay men in the general population (Montaño *et al.* 2017). A mathematical modelling demonstrated that a widespread PrEP use among gay men in US would result to increased STI diagnosis but will fall after (Jenness *et al.*, 2017). Another Mathematical modelling demonstrated 42% *Neisseria gonorrhoeae* and 40% *Chlamydia trichomatis* would be prevented in the next 10 years with lower *Neisseria gonorrhoeae* and *Chlamydia trichomatis* incidences being associated with higher PrEP coverage (Jenness *et al.*, 2017). The likelihood of acquiring *Neisseria gonorrhoeae*, *Chlamydia trichomatis*, and Syphilis infection among MSM PrEP users is 25.3, 11.2, and 44.6 times respectively, that of non-PrEP user MSMs (Kojima *et al.*, 2016). Meta-analysis and systemic review of 88 studies has suggested a pooled prevalence for composite outcome of chlamydia, gonorrhea and early syphilis to be 23.9% post PrEP initiation and a pooled incidence of 72.2 per 100 person years during PrEP follow up (Ong *et al.*, 2019).

Gonorrhea is considered by the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC), as a global health concern due to limited treatment options (Papp *et al.*, 2017a) and remains a global Public Health concern due to the development of resistant strains, having 98% of the isolates resistant to ciprofloxacin, penicillin, tetracycline and Azithromycin (Kulkarni *et al.*, 2016). Genetic analysis has indicated a different phylogenetic clade to the contemporary strains (Papp *et al.*, 2017a). Resistance to *Treponema pallidum* infections began in 1960's (Duncan *et al.*, 1989). Increasing tendency of macrolide resistant *T. pallidum* has been observed in several developed countries (Stamm, 2010). *Chlamydia trachomatis* treatment failure has been documented (Horner, 2012); increased susceptibility to antimicrobial resistance of *Trichomonas vaginalis* as a result of over reliance on nitroimidazoles, metronidazole and tinidazole (Kirkcaldy *et al.*, 2012); *Haemophilus ducreyi* responsible for Chancroid has been found to develop resistance to; tetracyclines, sulphonamides, streptomycin, kanamycin and chloramphenicol (Ison *et al.*, 1998); and *Mycoplasma genitalium* has demonstrated decreased susceptibility to macrolides (Jensen *et al.*, 2008), (Edouard *et al.*, 2017). In Kenya, STI services have been decentralized to primary health care level improving the efficiency in STI service delivery and syndromic approach to case management has ensued (Moses *et al.*, 2002).

Materials and methods

Study Site and population

The study was conducted in Nairobi County at the selected Key Populations Drop in Centres (DICES) / Prevention Centres located in various Sub Counties. Nairobi has a total of 17 Sub Counties and 22 Drop in centres/Prevention Centres. Out of the 17 Sub Counties, 9 Sub Counties host the 22 DICES/Prevention centres. The study Population were female sex workers aged 18 years and above. It is estimated that there are over 133,000 female sex workers in Kenya and Nairobi hosts over 29,000 FSWs. The population comprised of both HIV PrEP users and non-PrEP users; PrEP users had been on PrEP for at least six months at the time of recruitment. The Female Sex worker must have been in sex work while residing in Nairobi County for at least six months. Both HIV PrEP users and non- PrEP users participated. Adherence to PrEP medicines should have been at least at 85% as recorded in clinic encounter forms. FSWs less than six months' in commercial sex work and PrEP users with less than six months PrEP use were excluded from the study. FSWs not residing in Nairobi County, those using oral PrEP but were screened positive for STI during enrolment into the DICES/prevention centres cohorts and known HIV positive status were excluded. Other exclusions included; inadequate client history, Use of any other HIV prophylaxis technology and any participants accessing HIV and other STIs preventive and curative services at any other DICE/Prevention centre or health facility other than the one she had been selected to participate in the study.

Study Design and Sampling

A retrospective cohort study that employed quantitative data collection methods was conducted among the FSWs comprising both HIV oral PrEP users and non- PrEP users. A multi stage random sampling was espoused. Out of the 9 sub counties hosting DICES, one third were selected by simple random sampling. One third of the 22 DICES/Prevention centres (7 DICES/prevention centres) were selected by simple random sampling. The number of participants per DICE/prevention centre was allocated proportionately according to the total numbers of FSWs in each site's cohort. A simple random sampling was done using the key population listing. Equal number of participants; PrEP users and non-PrEP users were recruited at each site.

Data collection, management and analysis

A Quantitative data collection method was adopted. Data was collected using a data abstraction tool containing data elements that answered the questions on STI incidence and prevalence of bacterial STIs questions. The tool was adopted from the Kenya Ministry of Health (NASCO) Key Populations Monitoring and Evaluation tools (NASCO, 2014).

Research assistants were trained on data abstraction tool, abstraction process, documentation and data management before the study commenced. Each data elements listed in the data abstraction tools was obtained from every participant records. A data abstraction tool was filled for each participant. Equal number of files for the active PrEP and non-PrEP clients were identified. The clients' unique identifiers on every file were randomly sampled for participation. Clients' participants were identified and withdrawn from the shelves. The participants of the respective files were called to the DICE/Prevention centre for consenting. Once consent was obtained, a systematic six months' retrospective data abstraction from the treatment records of each participant was done to identify the incidences of STIs as recorded in the patients past six months' records. Only the clients who were screened negative for STI during enrolment into the DICES/prevention centers were eligible to participate in the study in order to

eliminate zero-time bias. At the time the clients were enrolled at the DICE/Prevention Center, they were free from STIs so that an STI free client were followed up for STI incidences in the cohort of PrEP and non-PrEP female sex workers.

The participants' records remained under lock and key during the entire study period. Data was analyzed using statistical software STATA (STATA, 2016) and Microsoft excel. Relative risk and Rate were determined as measures of association between PrEP use and STI rates. The rate of STI among the female sex workers who use PrEP and that of those who did not use PrEP. Relative STI risk was therefore computed to establish whether the use of oral PrEP increases female sex workers risk of acquiring STI. Consequently, the level of statistical significance of hypothesis was determined.

Ethical considerations

Ethical approval was obtained from the Kenyatta National Hospital- University of Nairobi Ethical Review Committee (KNH-UoN ERC No: P876/12/2018). An approval was obtained from the JKUAT Board of Postgraduate Studies (BPS), and authorisation from the partners implementing prevention services at the DICES/prevention centers. Informed consent was obtained from all eligible participants after the disclosure of all the information pertaining the study. There were no physical risks involved in the study.

RESULTS

Socio-demographic characteristics of FSWs in Nairobi County

A total of 336 participants were consented to participate. Among the respondents, 168 (50%) were HIV Pre-Exposure Prophylaxis (PrEP) users while 168 (50%) were non- PrPEP users. The mean age (SD) for FSWs not using HIV PrEP was 27.7 (5.8) years while the mean age (SD) for FSWs using HIV PrEP was 25.4 (5.53) years; and the minimum and maximum age for both the PrEP users and non-PrEP users are 18 and 50 years respectively. On marital status, majority of the respondents, 132(78.6%) PrEP users and 131 (78%) non-PrEP users were single as illustrated in (Table 4.1), while the rest of the respondents were either married, divorced or widowed. Majority of the respondents had between 1 to 3 children; 120(71.4%) of non-PrEP user and 98 (58.3%) of PrEP users respectively, while 38 (22.6%) and 63 (37.6%) of non-PrEP and PrEP users did not have children. The highest level of education for a half of the non-PrEP using respondents 84(50.6%) was primary school and 80(47.6%) were secondary school drop outs, while 85(51.2%) of PrEP users were secondary school drop outs and 78(47%) were primary school drop outs. All the respondents using PrEP 168(100%) were doing sex work solely as their occupation while 155(92.3%) of non-Prep users had sex work as their sole occupation, as shown in (Table 1).

Table 1: Socio-demographic characteristics of Female Sex Workers in Nairobi County

Characteristics	Frequency (%)	
	Non-PrEP n = 168	PrEP n = 168
Age		
Mean age (SD)	27.72 (6.58)	25.38 (5.53)
Marital Status		
Single	131(78)	132 (78.6)
Married	16(9.5)	14 (8.3)
Divorced/Separated/widowed	21(12.3)	22 (13.1)
Number of Children		
Without children	38 (22.6)	63 (37.5)
1-3 children	120 (71.4)	98 (58.3)
More than 3 children	10 (6)	7 (4.2)
Level of Education		
Primary and <	84 (50.6)	78 (47)

Secondary School	80 (47.6)	85 (51.2)
Tertiary	3 (1.8)	3 (1.8)
Source of Income		
Bar Attendant	6 (3.6)	0 (0)
FSW	155 (92.3)	168 (100)
House help	3 (1.8)	0 (0)
Saloonist	1 (1.8)	0(0)

FSW- Female Sex Workers; PrEP- Pre-exposure Prophylaxis

Common bacterial STIs affecting female Sex workers, both PrEP and non-PrEP users

Common Sexually Transmitted Infections that were identified among the female sex workers were arranged in order of most common to the least common STIs. As shown below, vaginitis 62 (52.1%) was the most commonly experienced STI among the respondents. Cervicitis was equally common with 26 (21.8%) cases reported among the respondents. Pelvic Inflammatory Disease (PID) caused by Gonorrhea and Chlamydia infections 10 (8.4%) cases were reported. Five cases of syphilis and Chancroid were also reported among the respondents. Non-bacterial STI cases were as well reported including; Genital warts 9 and Herpes Simples, 7. A composite prevalence of STIs among FSWs was determined to be 35.4% while the pooled incidence rate was 70.8 per 100-person time (Figure 1).

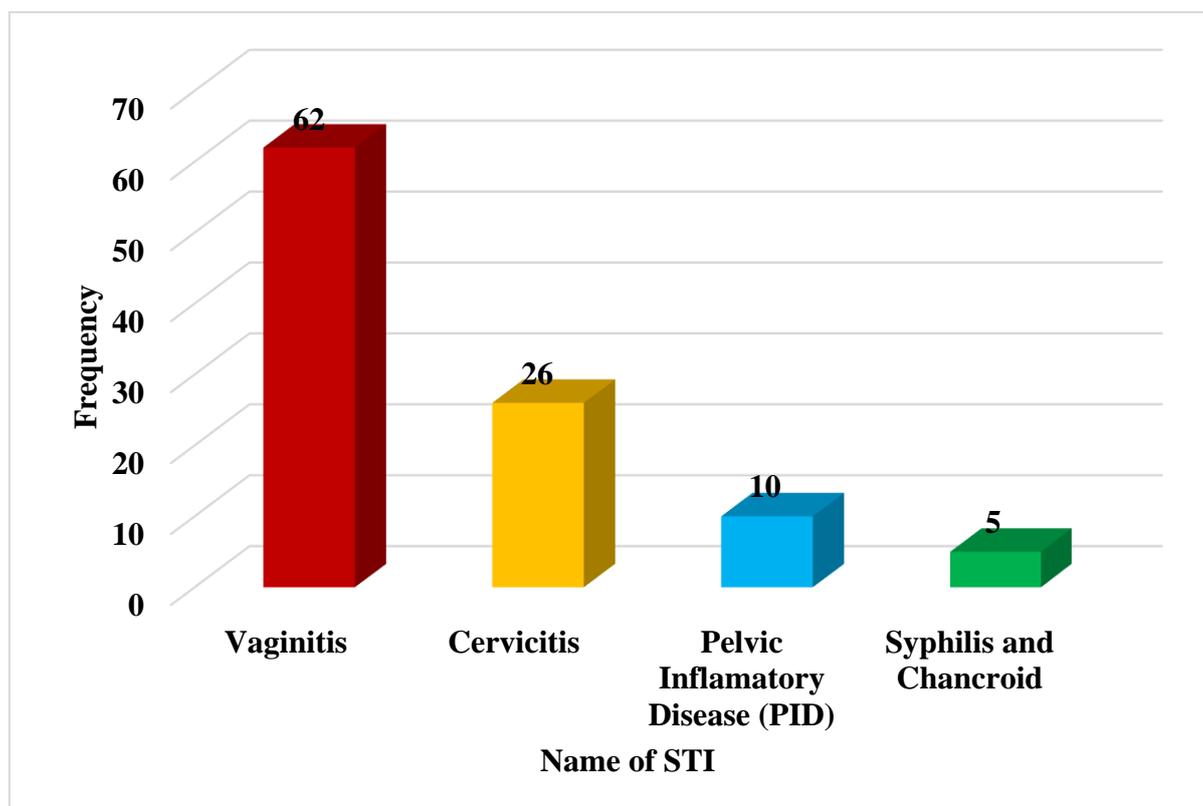


Figure 1: Common STIs Identified among the Female Sex workers in Nairobi County

Risk of STIs among FSWs in Nairobi across the study period

Cases of STIs were recorded for all the participants during enrolment and on every visit throughout the study duration. All the 336 participants were free from any STI at the beginning of the study. All the participants who were screened positive for any STI at the entry point were excluded from the study. Generally, higher number or STI cases among FSWs using HIV oral PrEP were observed in visit 4 (16), visit 5 (21) and visit 6 (13); compared to cases observed among non-PrEP users, in Visit 4 (10), visit 5 (8) and visit 6 (7). Cases of STIs in the second and third visits were fairly the same in both PrEP users 7 and 13; and non-PrEP users 9 and 14 with the difference in the STI rates having P-values exceeding 0.05 (Table 2)

Table 2: Risks of STIs among Female Sex Workers in Nairobi County

	Initiated on PrEP (%)		P-value
	No	Yes	
Treated for STI at Baseline			
No	168 (100)	168 (100)	
Yes	0	0	
Treated for STI at Month 2			
No	159 (94.6)	161 (95.8)	0.608
Yes	9 (5.4)	7 (4.2)	
Treated for STI at Month 3			
No	154 (91.7)	155 (92.3)	0.841
Yes	14 (8.3)	13 (7.7)	
Treated for STI at Month 4			
No	158 (94.0)	152 (90.5)	0.221
Yes	10 (6.0)	16 (9.5)	
Treated for STI at Month 5			
No	160 (95.2)	147 (87.5)	0.012*
Yes	8 (4.8)	21 (12.5)	
Treated for STI at Month 6			
No	161 (95.8)	155 (92.3)	0.167
Yes	7 (4.2)	13 (7.7)	

*Chi-square.

STIs- Sexually Transmitted Infections

STI Cases distribution over time

All the respondents were enrolled into the study at time zero with no STI infections. STI cases were observed over six months in both the PrEP and non-PrEP groups. More cases of STI were observed in non-PrEP users than in PrEP users in the first two months, post enrolment but cases among PrEP users increased steadily through to month five with a slight slump in month six. There was a reduction in STI cases among non-PrEP users from month three through to month six, (Figure 2).

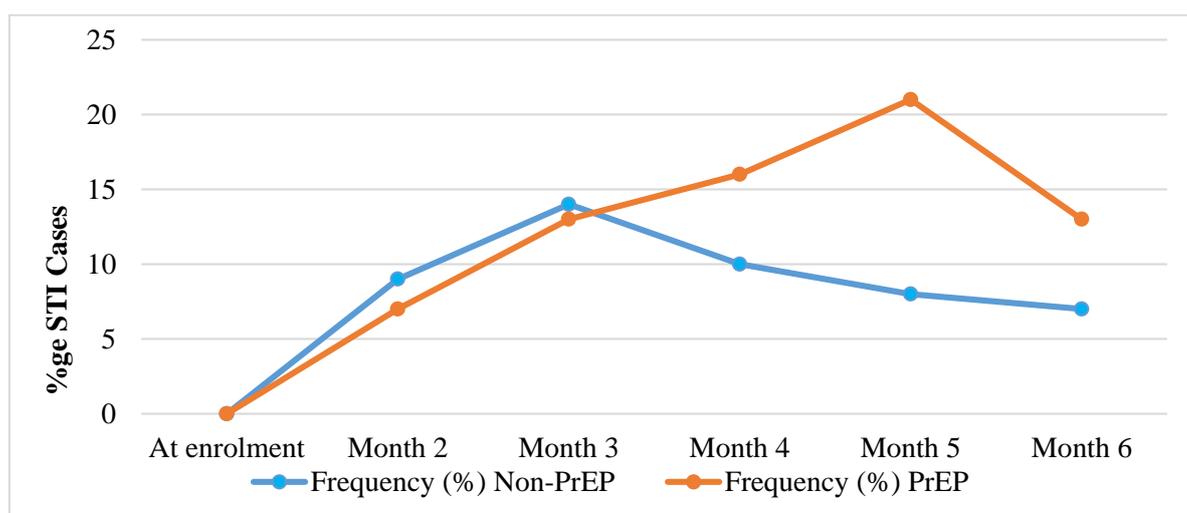


Figure 2: Distribution of STI cases through six months cohort among Female Sex Workers in Nairobi County

Sexually Transmitted Infection risk across socio demographic characteristics of FSWs in Nairobi County

The risk of acquiring STI across the socio demographic components and among the Female sex workers using PrEP for HIV prevention vary. HIV PrEP users are at 1.7 times higher risk of acquiring STIs, with P value of 0.064 at 95% confidence level, compared to female sex workers who do not use PrEP. Female sex workers who are widows are up to 8 times at higher risk of

STIs with P value of 0.002 (95% confidence level); while divorced/separated female sex worker are 3.4 times at higher risk of STI with P value of 0.001 (95% cl). No association was observed between the number of children FSW has and STI rate, however, increased number of sexual acts is associated with increased rate of STI (P value 0.012, 95%cl). This study did not find enough evidence to demonstrated association of condom use and increased STI risk (P 0.49, 95%cl), (Table 3)

Table 3: The risk of acquiring STIs among Female Sex Workers in Nairobi County

Variable	Haz. Ratio	[95% Conf. Interval]		P> z
Age	0.9996828	0.953552	1.048045	0.989
PrEP_use				
No	Ref.			
Yes	1.7085	0.769181	3.03919	0.064
Marital_status				
Married	0.8929631	0.27018	2.951307	0.853
Divorced/separated	3.393102	1.684423	6.835063	0.001
Widowed	8.220776	2.215328	30.50616	0.002
Number of children				
No_sexual_acts	1.150505	1.031008	1.283852	0.012
Condoms_use	0.9522935	0.828166	1.095025	0.493
occupation				
Bar Attendant	0.0308725	0.001777	0.536417	0.017
FSW	0.0683646	0.008699	0.537265	0.011
House help	2.73E-17	0	.	1
Saloonist	0.2722763	0.016813	4.409477	0.36

PrEP- Pre-exposure Prophylaxis; FSW- Female Sex Worker

Sexually Transmitted Infection risk among PrEP users

The risk of acquiring STI vary between the FSWs taking oral PrEP for HIV prevention and FSWs who do not take PrEP. The hazard ratio for STI between FSWs who do not use HIV oral PrEP and FSWs using oral PrEP for HIV prevention is 1.7085 with standard error of 0.494863, Z of 1.85 and P value of 0.064 at 95% Confidence Level. FSWs taking HIV oral PrEP are therefore 1.7 times higher risk of acquiring STIs than the FSWs who do not take PrEP. The significance level of acquiring STI while taking oral PrEP for HIV prevention is 0.064 at 95% confidence interval.

Sexually Transmitted Infections Hazard Estimate between PrEP and non-PrEP users

The risk of contracting STI among FSW over six months was evaluated using Nelson-Aalen cumulative hazard estimate. The blue line on the graph represents non- PrEP users while the red line in the graph represents PrEP users. As illustrated on the graph, the risk of STI among the PrEP users at the baseline was very low but constantly increased over time in each month of the cohort with the trend suggestive of a constant increased risk of STI beyond the study timeline. STI risk among the Non-PrEP users looks considerably lower than that of PrEP users and does not increase so significantly as compared to that of PrEP users (Figure 3).

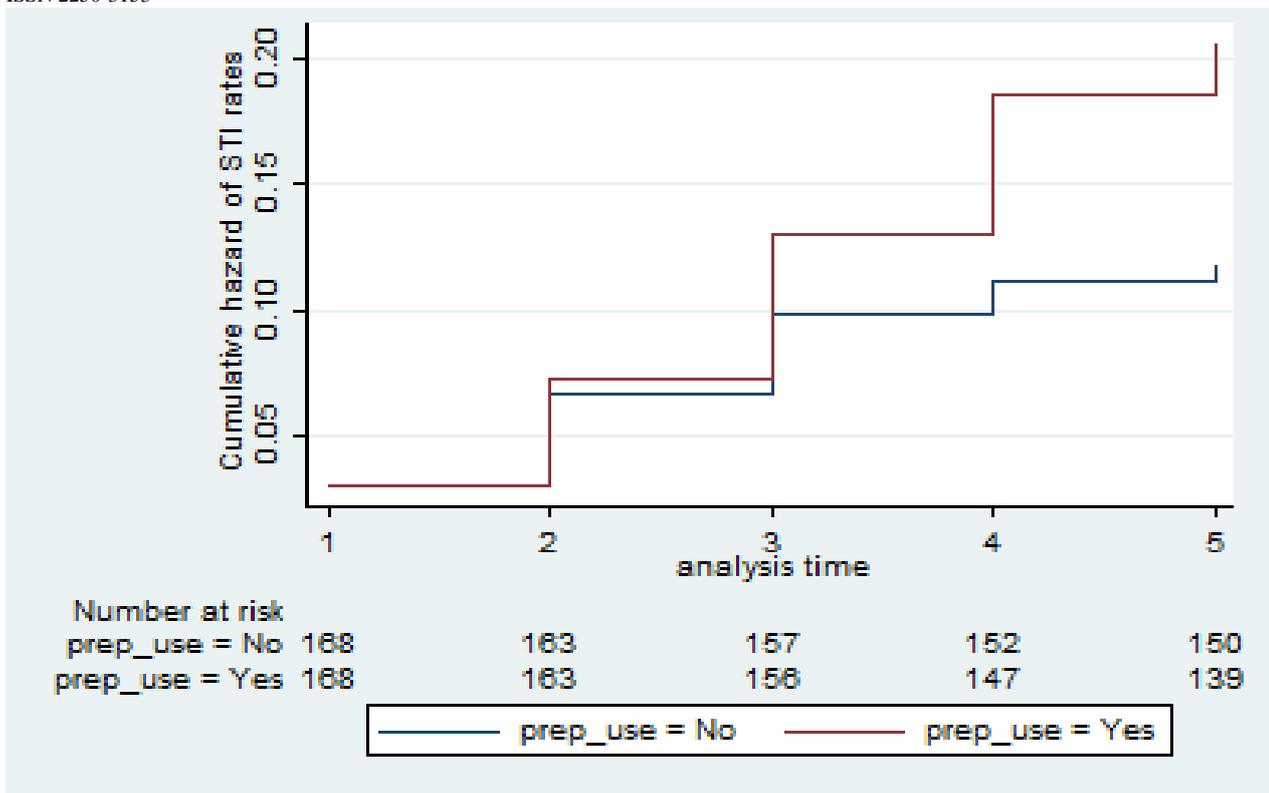


Figure 3: Cumulative hazard of contracting STI over time between the FSW who used PrEP and the FSW who did not use PrEP for HIV prevention in Nairobi.

DISCUSSION

Common Sexually Transmitted Infections affecting female Sex workers

According to this study, 52.1% of STIs affecting Female Sex Workers is as a result of Vaginitis which is caused by mixed microorganisms including; bacteria, yeast and trichomonas, but is predominantly caused by bacterial vaginosis (CDC, 2015), (Papp *et al.*, 2017b). Another common STIs seen in this study is cervicitis which can be caused by gonorrhoea, chlamydia or trichomonas (Katz *et al.*, 2012); and pelvic inflammatory disease (PID) which is mainly as a result of gonorrhoea and chlamydia infections. Meta-analysis and systemic reviews have suggested pooled prevalence for composite outcome of clamydia, gonorrhoea and early syphilis to be 23.9% (Ong *et al.*, 2019), which agrees with the findings of this study. A few participants were also diagnosed with syphilis and chancroid. These findings are consistent with WHO declaration of gonorrhoea as a global health concern. The findings of this study is also coherent with (Mayer *et al.*, 2014) findings in which 32.8% of bacterial STIs were diagnosed among participants using PrEP for HIV prevention. Studies have demonstrated pooled incidence rate of over 70 per 100 person years during PrEP follow up (Ong *et al.*, 2019) which compares with the finding of this study that revealed a pooled STI incidence rate of over 70 per 100 person years.

Risk of STIs in PrEP and non- PrEP users among female sex workers

In this study, all the participants recorded no STIs at the beginning of the study, but over time, it was observed that STI cases in PrEP users increased steadily until month five where there was a slight slump in cases of STI; whereas, STI cases in Non-PrEP users increased in the first three months but demonstrated a steady decrease from month three to month six; this finding is similar to a mathematical modeling in another study, which demonstrated a widespread PrEP use among gay men would result in increased STI diagnosis but would fall after a year with assumptions that all STIs diagnosed are treated (Jenness *et al.*, 2017). The slump that was observed in this study in month five could possibly be explained by other factors other than behavior change.

Cumulative hazard of contracting STIs among the HIV oral PrEP users was very low at the first month but increased consistently over the studied period whereas the cumulative hazard of STI among the non-PrEP users was slightly higher than that of non-PrEP users at the beginning but remained low with very slight increase over time, similar to (Kojima *et al.*, 2016) meta-analysis in which the STI incidence rate ratio was over 25 times that of non-PrEP users, however, the STI hazard ratio between PrEP users and non-PrEP users was lower in this study. While (Liu *et al.*, 2016) has demonstrated an overall high STI incidences but did not increase over time among MSM using PrEP for HIV prevention, this study has suggested similarly higher STI incidences among PrEP users which increased over time. Also in agreement with this study is (Ong *et al.*, 2019) which similarly demonstrate high composite incidence rate (72.2. per 100-person time) and polled prevalence of STIs of 23.9%. These findings are however contrary to the findings of (Mattson *et al.*, 2008) which demonstrated insignificant difference in the rate of gonorrhoea, chlamydia, and trichomona infections in a randomized clinical trial between the circumcised and uncircumcised males participants.

In this study the hazard ratio of acquiring bacterial STI given that one is taking oral PrEP for HIV prevention is above one indicating that persons taking HIV oral PrEP are 1.7 times at higher risk of acquiring STIs than non-PrEP users, similar to (Hoorneborg *et al.*, 2019). The finding of this study on the association between HIV oral PrEP and incidences of STIs is insignificant and demonstrates that inconclusive inference can be made to support higher rate of STIs among PrEP users than non-PrEP users. This finding is contrary to the findings of (Montaño *et al.* 2017) which demonstrated up to 20 time higher rates of STIs among PrEP users than non-PrEP users, but the finding is in agreement with (Jenness *et al.*, 2017) demonstrated in a mathematical modelling that STI diagnosis would increase initially but fall within one year of PrEP use and is as well consistent with the findings of (Freeborn & Portillo, 2017).

Conclusions and recommendations

Vaginitis, cervicitis and pelvic inflammatory disease (PID) caused by gonorrhea, chlamydia or trichomonas, are the most predominant STIs identified among FSWs. This study has recorded high composite prevalence of STIs among FSWs in Nairobi County. The study has also demonstrated an increasing trend of bacterial STIs incidences and cumulative hazard rate among FSWs using oral PrEP for HIV prevention over the six months study period, whereas the STI incidence rate and cumulative hazard rate among the non- PrEP respondents has displayed a very slight increase with decrease in STI incidences as the study progresses over the same period. The STI hazard ratio between FSWs using HIV oral PrEP and non-PrEP users demonstrates that PrEP users are up to 1.7 times at risk of STI than non-PrEP users, but statistically insignificant (0.064, 95%CI). Therefore, this study does not have enough evidence to demonstrate that the use of HIV oral PrEP for HIV prevention among female sex workers increase risk of acquiring STIs.

STI prevention counselling should be emphasized during HIV PrEP initiation and during follow up; including advocating for combination prevention involving condom use alongside PrEP, and reducing the number of sexual acts per day to minimize STI exposure. Need to tailor STIs prevention intervention among HIV oral PrEP users and other non-PrEP using key populations according to their behavioural profile. Longitudinal cohort study that will run for at least one year to be conducted and diagnosis of sexually transmitted infections done using biological samples.

ACKNOWLEDGMENT

I thank the Almighty God for His grace. I would like to express my deep gratitude and acknowledgement to Mr. Christian Ochieng, Dr. Lilian Otiso, Dr. Cleophas, Dr. Lina, LVCT Health research team and the entire LVCT Health fraternity for their unconditional support. Many thanks to BHESP administration and participants. Finally, I wish to thank my family for their support and patience through the gruelling journey.

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Sustainability: Definitions Vs Interpretations

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DOI: 10.29322/IJSRP.10.09.2020.p10539

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10539>

Abstract- It can be stated that "thirasaara" (තිರසාර බව) is one of the most popular words in the so-called developed and standardized world that is considered to be developed. This article questions the extent to which the concept of "thirasaara" (in English 'sustainability') is defined reasonably, while this study focuses on the main purpose and two additional objectives. The main purpose is to present a more reasonable definition for "thirasaara" (sustainability). Additional objectives are to distinguish definition and interpretation and to suggest a definition for the term 'definition'. This study used "pada nirukthi" (මොක්සලා; or etymology of words in English) as a method. Etymology used in this study was primarily cross validated (in confirming its accuracy) through historical sources, Sri Lankan Literary Criticism Language training and Sri Lankan folk standard. Since a mother tongue is more helpful to understand an inherent meaning of a word better, "thirasaara", which is the Sinhala word for sustainability was used in this study in providing a just definition for the sustainability in the context of Sri Lankan culture based on unique "pada nirukthi" (මොක්සලා; method. The nature of this study is descriptive. Although the term 'sustainability' has been interpreted differently according to various purposes, this study confirmed that those definitions hardly derived the fairest definition for "thirasaara". According to the "pada nirukthi" method used in this study, it was found that continuously maintaining the conceptual nature is "thirasaara". In other words "thirasaara" is maintaining "saara" things in a "thira" way. The definition, which uncovers the quality of "thirasaara" is uncovering self-aromatic properties and Arya qualities or uncovering "Swayn Bhu Ariya Guna". Further studies are needed to explain the components of "Swayn Bhu" and "Ariya Guna" and this need for a further study is being introduced as a research gap. In conclusion, the study emphasizes that it is more appropriate to consider the "pada nirukthi" of any word from its mother tongue with an open mind based on its cultural heritage, language and peculiarities to understand the real meaning of a word.

Index Terms- Sustainability, "pada nirukthi", Definitions, Interpretations

I. INTRODUCTION

Introducing this study, it is essential to answer four major questions: 1). What is the proposition of this study? 2). How does the main proposition of this study impact different communities? 3). What are the possible consequences of addressing and not addressing the problem above? 4). What is the approach

to solving the problem as mentioned earlier? 5). What are the main and specific objectives of my study? The contemporary world community is experiencing a number of problems at one time. Among those problems, global warming has become a critical issue. Also, the current warming trend is of explicit significance as a result of most of it's very probably (greater than ninety-five per cent probability) to be the results of the act since the mid-20th century and continuing at a rate that's unexampled over decades to millennia'. The twelfth edition of the annual international Peace Index (GPI) report, made by the international think-tank the Institute for social science and Peace (IEP), disclosed that the globe is a smaller amount peaceful these days than at any time within the last decade'. Some 795 million individuals still suffer from hunger and over 2 billion from substance deficiencies or styles of over nourishment. As stated by the United Nations, there is an increase in funding to support people from all over the world to provide protection and humanitarian aid. Another drawback, which is changes in the state power challenging governance and changing the nature of power, will drive major concerns over the next five years. They will raise strains across all regions and types of governments, both within and between countries. And, the global trends report in 2014 shows that unemployment of the youth has been drastically increased after the global financial crisis. By pointing out all these background information, what I am trying to highlight is that the global citizens are experiencing many political, economic, social technological and environmental issues regardless the stage of development of a country. In other words, developed countries, developing countries and underdeveloped countries are facing to same political, economic, social technological and environmental issues in different quantities and different aspects. The major cause of these issues is either scarcity of resources or abusing of resources and the imbalance of the natural environment due to modern technological applications. It can be seen that scholars, scientists and experts are trying to provide solutions for these root described above causes. And most of these solution experts believe that the most reasonable and sustainable solution for such problems is to adopt a sustainable development model or "thirasaara sanwardhana" model. United Nations Report (2015), describes that most of the countries in the globe agreed to finish poverty-related issues, secure the planet earth and keep maintaining the prosperity of the globe on 25 September 2015. This agreement is known as the sustainable development agenda, and the countries are trying to implement sustainable development-related goals within 15 years from 2015 (United Nations Report, 2015). The collective motivation to achieve these goals can be seen when

observing numerous initiatives that took place under the umbrella of the United Nations. Yet the problem is that I have hardly found any "*thirasaara*" definition for the concept of "*thirasaara*" (sustainable definition for the concept of sustainability). Say for an example, O'Riordan (1988) delineate sustainability as a doubtless insignificant conception. Jacobs (1991), and later Giddings et al. (2002), emphasized that sustainability is a contested conception indiscriminately formed by people's preferences and worldviews. Daly & crusader (1992) magnificently commented that sustainable development is a self-contradictory concept while Hopwood et al. (2005) saw it as an unclear conception that failed to offer comfortable intending to guide policy. Recently, Stafford-Smith (2014) and Stokstad (2015) have delineated this concept of sustainability as imprecise, weak and fragmented. Thus, these examples represent simply a little fraction of the critique. Sofoluwe, (2015 O' Riorden, 1985) makes inquire into the quality shaping sustainability; describe it as an exploration into a tangled abstract jungle wherever watchful eyes lurk at each bend.' The word sustainability is employed by several organizations, companies and domains. However, the general public seems to have a completely different understanding and that emphases for me to say that there is no generally accepted definition for the concept called sustainability. Based on these facts, I must say that strength of a basement impacts the strength of the whole building or any construction. The same applies even for a concept, project, concept or a theory. In other words, if the basement or the core of any mechanism is weak, the whole thing that is depended on the core also becomes weak. Or else, the expected outcomes of a mechanism or a system will not be seen as results due to the weaknesses of the core function. By having this assumption in my mind, we wanted to achieve the purpose of this study, which is to provide a solid definition for the concept of "*thirasaara*".

In the world context, it is timely important as well as critical to understanding the specific definition of the "*thirasaara*". From one side, the whole international community has accepted that "*thirasaara sanwardhanaya*" (sustainable development in English) is one of the major solutions for many global issues. On the other side, existing global issues show a positive correlation. If we are not terminating this positive correlation attached to global issues or not providing solid solutions to global issues, not only one country but also the whole world will suffer from these global issues. But, should there be a solution for these global issues the whole world experiences the consequences. Therefore, it is critically important to specifically identify the meaning of "*thirasaara*" at this moment. Hence, the main purpose of my study is to present a more reasonable definition for "*thirasaara*" (sustainability). Other two intentional purposes are (1) to distinguish definition and interpretation and (2) to suggest a definition for the term 'definition'.

II. DATA AND METHODOLOGY

We are describing this section under three sub-themes. 1) Introducing "*pada nirukthi*" (mo ksrela;s) method. 2) Identifying the real meaning through ones' local language (mother tongue). 3) Using history, one's cultural heritage, language and peculiarities to understand the real meaning of a word. As the approach of this study was to question to how extent the standard reality is correct,

I had to keep the methodology of my study away from the standard reality. As a result of that, I could identify a method called "*pada nirukthi*" (etymology in English), which was unique to Sri Lankan community since 2500 years back and not a common method in the world standard. "*Pada nirukthi*" method, which is discussed in this study is quite different from what we know as etymology. Modern etymology in the standard world studies the origin, history and rise of grammar. "it is simply a parody of the etymologies (nirukti) in which the Brāhma' as and Upanisads abound. These etymologies are not botched attempts at history or linguistics by people who did not know any better (and produced vyākaraṇa!) but attempt to discover some eternal inner significance in the Sanskrit language, which they conceived of as a blueprint for reality" (Richard Gombrich). However, his statement is also flawed. Because Sanskrit is a created language, it is necessary to have a root language to understand the basic meaning of a verse. Thus, the term etymology could be used as the method of aesthetics, after studying etymology and to some extent, the knowledge of it. The term etymology used here is based on the theory of properties, traits, qualities and trait sounds. The term etymology was undoubtedly usable because it was a methodology. (Nirukthi Patha Sutta) (Hela Bodu Piyuma Daham Magazine) (Rev. Mukalangamuwe Pagnananda, KD Rajapaksa 2011, 2013, 2013a, 2017).

The most effective and logical way of dealing with the eloquence of a verse is by using the etymology method with the local language of that word. For example, it is more logical to construct the definition of the term "sustainable" in the Sinhala language (සිංහල) of Sri Lanka rather than the definition of etymology. This is because the language, culture, and history of the country that is being considered in this way are based on "*Pada nirukthi*" method. For example, in English, the concept of the '*wewa*' (වැව) is introduced as 'tank'. As the definition of the tank, there are many interpretations given in English such as 1: a usually large receptacle for holding, transporting, or storing liquids (such as water or fuel) 2: an enclosed heavily armed and armoured combat vehicle that moves on tracks (*merriam-webster dictionary*). A *tank* is a large container for gases or liquids, like a *tank* of oil. Another kind of *tank* is an armoured military vehicle with a cannon *^vocabulary dictionary* & "Storage tank definition: A storage tank is a large vessel for storing oil, gas, and other petrochemical products (*collinsdictionary.com/dictionary*). But the definition of a lake is quite different. To understand this, it is necessary to know the views held by the *Hela Rata* people who built these tanks. Otherwise, it would not help to understand the real definition of *wewa*. Sri Lanka is a rain-fed agricultural country. The king, the ruler of the country, did not intend that the rains should not be used without a single drop of rain falling on the ground (The King Parakramabahu said: "Not allowing a single drop of water falling from this sky to sea without serving the ecosystem and mankind") (The vision, Irrigation Department, Sri Lanka). This suggest that, people built tanks or they created a tank to collect rainwater. This means that the word "*wewa*" has the meaning of "falling water from the sky" or "rainwater". This means that if anybody uses the word tank or other word for '*wewa*' the real definition of that term becomes hidden. To further explain this concept of the importance of using "*Pada nirukthi*" method, the following example is also helpful. In English, there are interpretations for a king such as: "a male ruler of a country who

usually inherits his position and rules for life. According to *merriam-webster dictionary*, a king is a man who is the most important member of the royal family of his country, and who is considered to be the Head of State of that country. According to *collinsdictionary dictionary* the male ruler of an independent state, especially one who inherits the position by right of birth. *Oxforddictionary* mention that a king is a male sovereign or monarch; a man who holds by life tenure, and usually by hereditary right, the chief authority over a country and people. But the definition of Hela-based literary texts for the "king" is different. According to *Nirukthi Patha Sutta, the king is Raja (රජ)* in *Hela Basa*. Thus the definition of *Raja* is the person who heals people (ජනතාව රංජනය කරන්නා). The analysis of the study was carried out separately per each objective. Accordingly, the three objectives, such as differentiating definitions and interpretations, introducing a definition for definition and defining sustainability, have been analyzed separately.

III. ANALYSIS

As stated in the study methodology, this analysis is presented in four separate analyzes based on three objectives of the study. Accordingly,

Sub-main objective 1.1. Separating definitions and interpretations:

The English word for නිවර්තනය is definition. The words are used in the Sinhala language to describe නිවර්තනය are: to mean/ අරුත් විග්‍රහය, to interpret/ අරුත් දැක්වීම and to describe/ විස්තර විභාග දැක්වීම. In English, there are many similar terms used for this term definition, such as meaning, description, explanation, classification, characterization, designation, delineation, demarcation. The term 'meaning' is used in Sinhala with different meanings such as තේරුම/meaning, අදහස/intention, අරුත/meaning, අභිප්‍රාය/intent, ඡායා/ image, ඡායාව/ shadow, භාව/sense, භාවය/ character. Similarly, for term 'description', there are words used in the Sinhala language such as සටහන /Note , වැණුම /salute, වැණීම/worship,වරණනාව/choice,වරණනය/choice,විස්තරය/description. For the word explanation there are Sinhala terms used such as පහසුද්වය/description, ව්‍යාකෘතිය/description, තේරුම/interpretation, උද්දේශය/interpretation, අනුවාදය/description, විස්තර කිරීම /description, විස්තරය /commentary, විවරණය /explanation, පහදා දීම/ use, පරිදිපනය /excuse, නිදහසට කියන කරුණ/commentary, ව්‍යාධිකතනයල විස්තර කථනය /commentary. The term 'classification' also has several Sinhala words such as වර්ග කිරීම /sort, වගකීම/classify, රාශීකරණය /classify, පංතිවලට බෙදීම/ divide into classes. To describe the word characterization in Sinhala, there are terms such as විස්තර කිරීම /describing , විදහා දැක්වීම /displaying , විදහා පෙන්වීම /demonstrating , රහපෑම /acting and චරිතායනය /characterizing. To describe the term designation in Sinhala there are words such as නාමෝද්දේශය /nomenclature, නිල නාමය /official name, නිමිතිකරණය /designation, අභිධාල අභිධානය /title, උපාධිය /designation, තනතුර/title, පදවියේ නම/designation and නියම කිරීම /designation. Also, for term 'delineation' there are Sinhala words such as නිරූපනය /illustration, රූප සටහනින් දැක්වීම/ diagramming, රූප ලේඛනය/ diagramming where the term 'demarcation' has Sinhala words such as අංකිත සීමාව /numbered limit, සීමාකනය /restricted,

ඉම ලකුණු කිරීම/ unmarked and ලකුණු කළ ඉම/ marked according to *Madhura Dictionary*.

Does this mean that a definition, an interpretation, an explanation, an attribute, a definition, or an aptitude are any definition? For words such as meaning, description, explanation, classification, characterization, designation, delineation and demarcation, we found 9, 6, 13, 4, 5, 9, 3 and 4 similar words. The sum of those words is 53. When adding the words such as meaning, description, explanation, classification, characterization, designation, delineation and demarcation to that count, the total amount increases up to 61. This count might become bigger. However, the root of all these words is 'definition'. It means that we have to accept any concepts when it is explained in any way. For example, we must accept that it is a definition when the concept of sustainability is defined either as an explanation, description, clarification, characterization or classification. This nature has been taught in defining the sustainable concept of the standard world.

For an example, sustainability is the ability to continue a defined behaviour indefinitely according to the definition of sustainable development from *Our Common Future*, by the World Commission on Environment and Development (1987, p. 43). In addition to that the most referenced definition by organizations such as United Nations and scholars is that sustainable development is as a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Doing so must integrate and balance economic, environmental, and social goals. This definition was introduced through the report of the World Commission on Environment and Development, *Our Common Future* by United Nations, 1987. Both these given definitions can be considered as descriptions or explanations to the definition of sustainability and sustainable concept. When we were raising a question in Research Gate platform, a scholar (Douglas Nuttall, 2018) mentioned that "Brundtland's famous 'definition' is a description, and while it is completely satisfactory as a description, it is not definitive. Much of the challenge relating to sustainability comes from finding definitions that are consistent with the description that is also self-consistent. They also tend to be aligned with the biases of the authors, which means one set of definitions may be conflicting with any other set of definitions".

Sub-main objective 1.2. Definition of definition:

Before defining any concept, it is essential and core to define what a definition is. In other words, a scholar working on a concept should clarify the derived word of a term or the word that is determined by the verse (*nir+uktha*), or the word derived from the verse, is defined as the etymology of the verse (*pada nirukthi*). In simple words, we should be able to nude the word and understand the concept clearly.

Main objective 1. Definition of the concept of *Thirassaara/sustainability*:

The analysis of the study is carried out in three stages, as stated in the methodology. Accordingly, examining the keyword meaning of the concept of sustainability is the first step. The definition of sustainability can be defined as the following. Although the word '*Thirasaara /sustainable*' is meant to convey

one idea, it is composed of two words. Or it is made up of a combination of two terms. *Thira* one word. *Saara* is another word. There are different uses for word *thira* such as *pahan thira* (පහන් නිර), *wahum thira* (වැහුම් නිර) and *kada thira* (කඩනිර). Therefore, we should be wise to choose the most appropriate word that can be applied to the situation of meaning. Therefore, it is required to provide the meaning *isthira* (ස්ථිර) to the word *thira*. *Hela Jana Wahara* (හෙළ ජන වහර) or fork vocabulary come in handy in such circumstances. To choose the most appropriate word and meaning that matches to a word *hela jana wahara* are a useful source. When a problem was dragging for a long period without a solution, there was a forks' saying such as 'Isn't there an *isthira saara* solution for that? (මෙයට ඉස්ථිර සාර විසඳුමක් නැද්ද?). The word *isthira* also contains two words. *Is + Thira* (ඉස් + නිර). When something is covered, and that cover has lifted the thing that was covered becomes visible. In other words, something to be visible that thing must be uncovered. The same thing happens when a *thira* is lifted or opened (*is*). Therefore, *is thira* is uncovered or opened. Thus, this is how we developed the meaning of *thira* step by step. *Thira* (නිර) > *Sthira* (ස්ථිර) > *Isthira* (ඉස්ථිර) > *Is + Thira* (ඉස් + නිර). Now we have to study what happens when a *thira* is opened (*is*). Once this process is studied, it is considered as the second of this analysis. In normal social practice, what happens after lifting a curtain is the visibility of an uncovered thing/ place. The nature of lifting or opening a cover/ curtain is openness. This means that something must be uncovered. An uncovered thing leads to openness. Otherwise, a thing will not shine when covered. When the Dhamma was opened, it is shined. This is a discipline preached by the Buddha: තලාගතප්පවෙදිනො ධම්මවිනයොල භික්ඛවෙල විවටො විරොවතිල නො පටිච්ඡන්තො- මහණනි, තලාගතයන් වහන්සේ විසින් දේශනා කරන ලද ධර්මය හා විනය විවෘත වූයේ බලලයි. වැසුනේ නො බලලයි (අඬුගුන්තර නිකාය) / "Bhikkus, the teaching and discipline declared by the Tathāgata shine when manifest and not when covered" (Anguththra Nikaya)¹⁷. Here we should not consider Dhamma as a religious concept. Dhamma must be considered as a thing that bears something (ධර්මය යන්න යමක් දරන ස්වභාවයෙන් සැලකිය යුත්තා හ). Now we are considering the second word of *isthira + saara*. *Saara* is *saarathwaya*/ standard. None can describe *saarathwaya*/ සාරත්වය in a personal point of view. Once the personal bias emerges a *saara* thing for one person might become an *asaara* (unstandardized) thing to another person. The meaning of *saara* must be chosen without personal biases, and we must be considerate that the chosen meaning of *saara* is aligned with the word *isthira*. For an example, drug business/ war arms business has become a *saara* business in the current world. But these businesses are not *saara* businesses according to the perspective of society. Those businesses are harmful to society and rejected by the law. Therefore, those businesses are not *isthira*. Now we have a problem. In contrast to what, should we find the meaning of *saara*?

For that it is required to find how the word *saara* was born. *Saara* is derived from *swa+aara*. Once a gain there are two words enclosed in the word *saara* (සාර). *Swa* (ස්ව)+ *Aara* (ආර). There are many words in Sinhala that starts from *swa*. Direct English terms for ස්ව (self, auto and aut) can be found as well. For the word 'self' there are words such as සයං/ *sayan*, ස්විය/ *sweeya*, සිය/ *siya*, ආත්ම/ *aathma*, ආත්මාචර්ය/ *aathmarthaya*, ආත්මය/ *aathmaya*, තමා/ *thama*, ස්වයං/ *swayan*, ස්වකීය/ *swakeeya*, ඉබෙ/ *ibe*, ස්වයංභූ/ *swayanbhuu*, තෙම/ *thema*, තෙමේ/ *thme*,

අස්මිතා/ *asmitha*, අස්මිතාව/ *asmithawa* used in Sinhala. In addition, there are terms used such as ස්ව සේවය (self-service), ස්ව ජන්මයි (Sui Generis), ස්ව ප්‍රාග්ධනය (Own Capital), ස්වායක්ත (Independent), ස්වායක්තතාව (Selfdependency), ස්වායක්ත (Autonomous), ස්වායක්ත ඉව්චාව (Well Free), ස්වාධීන (Self-governing, Free, Independent), ස්වාර් ට(Once Own Benefit), ස්වභාවික (Natural, Unforced), ස්වාභාවික සම්පත් (Resources, Natural), ස්වාභාවික නියමය (Natural Law), ස්වසහසම්බන්ධය (Autocorrection), ස්වස්ථ (Whole), ස්වයං පෝෂිත(Self-sustaining), ස්වයංක්‍රීය කරණය (Autonomation), ස්වයංජාත (Autogenous), ස්වදේශ (Home, Native,), ස්වකීය (Own, Personal, Proper), ස්වරූපය (Nature, Form), ස්වනන්ත්‍ර (Liberal, Autonomous) and ස්වභාව (Nature) (*Madhura Dictionary*)¹⁹ attached to the word *swa*. Then it is required to find how the word *aara* was born. It is appropriate to describe how the word *aara* is used in different places. There are eight words in English usage for *aara*. Those are race, track, brook, creek, effluent, lineage, river and are. There are number of meanings to race in Sinhala such as *pelapatha* (පෙළපත), *Jaathiya* (ජාතිය), *aara* (ආර), *sera diya pahara* (සැර දිය පහර), *sanuhara* (සනුහර), *wanshaya* (වංශය), *wargaya* (වර්ගය), *race diwima* (රේස් දිවීම), *wina gamana* (වින ගමන), *wargayaa* (වර්ගයා), *wegayen duwanawa* (වෙගයෙන් දුවනවා) and *wegayen kriya karanawa* (වෙගයෙන් ක්‍රියා කරනවා). Also, there are number of meanings to track in Sinhala such as *aaraya* (ආරය), *peelipaara* (පීලිපාර), *maargaya* (මාර්ගය), *mankada* (මංකඩ), *dumriya maargaya* (දුම්බිය මාර්ගය), *ahara* (අහර), *adiya* (අඩිය), *adipaara* (අඩිපාර), *paasatahana* (පා සටහන), *magha* (ගම), *pathaya* (පථය) and *pasupasa luhubandinawa* (පසුපස ලුහුබදිනවා). The word brook also has several Sinhala meanings such as *diyaththa* (දියත්ත), *diyappara* (දියපාර), *dola* (දොළ), *ela* (ඇළ), *oya* (ඔය), *iwasanawa* (ඉවසනවා) and *idadenawa* (ඉඩදෙනවා). For the word creek Sinhala words such as *kuda kalapuwa* (කුඩා කලපුව), *kuda ganga* (කුඩා ගඟ), for the word effluent Sinhala words such as *pitata gala yana* (පිටට ගලා යන), *apawahana* (අපවාහන), *ganga* (ගඟ), for the word lineage Sinhala words such as *pelanthiya* (පෙලන්තිය), *wanshaya* (වංශය), *pelapatha* (පෙළපත), *aara* (ආර), *anwaya* (අන්වය), *paramparaawa* (පරම්පරාව), *parapura* (පරපුර) and *pelanthiya* (පෙලන්තිය) were found. The word river is known in Sinhala as *gangaawa* (ගංගාව), *ganga* (ගඟ), *gala yana diya paara* (ගලා යන දිය පාර), *nadiya* (නදිය), *nee* (නී), *waahinee* (වාහිනී) while 'are' is described through *aaraya* (ආරය) according to *Madhura Dictionary*²⁰.

Describing base synonyms for *aara* can be continued further. How? By referring to the next level of synonyms that can be obtained for the first set of identified synonyms for *aara*. For an example a synonym for race in Sinhala was found as *wanshaya* (වංශය). When finding synonyms for *wanshaya* there were another set of words such as ancestry, birth, clan, contraternity, genealogy, house, line, lineage, parentage and seed. The word ancestry is described in Sinhala as *wanshaya* (වංශය), *pelanthiya* (පෙලන්තිය), *pelapatha* (පෙළපත), *kula paramparaawa* (කුල පරම්පරාව) and *parapura* (පරපුර). For the word 'birth' Sinhala words such as *sambhuthiya* (සම්භූතිය), *hata ganeema* (හට ගැනීම), *muularambhaya* (මූලාරම්භය), *themagula* (තෙමඟුල), *aathmabhawaya* (ආත්මභාවය), *udbhawaya* (උද්භවය), *uthpaththiya* (උත්පත්තිය), *ipadeema* (ඉපදීම), *upatha* (උපත), *upannaya* (උප්පන්නය), *jaathika* (ජාතික), *janmaya* (ජන්මය),

jammaya (ජම්මය), *prabhawaya* (ප්‍රභවය) and *prasuuthiya* (ප්‍රසුතිය) can be found (*Madhura Dictionary*)²¹.

There is another meaning for 'aara'. Contemporary Lankas are known as ancient *hela* people. *Hela* people are *Aaryayans*. That can be confirmed in two ways. According to free dictionary, aarya people were a member of an Indo-Aryan-speaking, chiefly Buddhist people comprising the majority of the inhabitants of Sri Lanka. Secondly, Indo-Aryan language was considered as of the language of Sinhalese (The free dictionary). *CP Wijayaratna* (1889) also mentioned that "Hence publishing a compendium of **"Aryan Sinhalese Names,"** the *Saarasavi Sañdarāsa* office urged its readers and through the wider public to adopt these and abandon foreign name to "continue untrammelled the Aryan-Sinhalese race." Further *CP Wijayaratna* (1889) says that the national costume of males was *aarya Sinhala anduma* and men wore a *sarama*. The national costume of females was *osariya* (*CP Wijayaratna*, 1889). "how female should conduct themselves" were quite clear in that respect; 'A proper blouse should cover the breast, stomach and back completely. A cloth ten *riyans* long should be worn as the **osariya** or sari. *Ananda Guruge* (1963). This statement suggests that *Osariya* is a moral dress. The *osariya* was the 'moral dress' of ladies. That was the authentic, unspoiled and 'pure' dress of the Sinhalese, and this despite its appearance in Sri Lanka during the Nayakkar period. Authenticity was *Kandian*.' *Nira Wickramasinghe* (2006). When seeking pada nirukthi of this *osariya* (*us + ariya*) it has *ariya/ aarya* quality. As this word derived from *us + ariya*, this word suggests that *osariya* is a symbol of mastering aarya qualities. "Ladies wear an *Osariya* with lifted *ariya* qualities. These *Hela Aaryayans* found several social interaction methods to represent their *aarya values*. i.e. "Ārya Subōdha Nātya Sabhā" of John de Silva founded in 1903; the essence of verses *Ariya vata* (The Āryan Ethics) purporting to "train the Sinhalese children in Āryan ways and customs" (*Silumina*, September 1908); the bilingual (Sinhalese and English) periodical *Āryayā* founded in 1909; and the weekly newspaper *Ārya Sinhala Vanśaya* (1912) published in Gall. (*Pannasekara 1968:191, 294 cited KNO Dharmadasa* (1992)). Even the culture of these people represents the word *ariya*. For an example there is a saying among Sinhalese as "*aare guna naare/ ආරේ ගුණ නෑරේ*"

(Theekshana Anuradha (2018)). When considering this word *ariya*, *riya* in Sinhala is an object that used to travel. We do our *sansaara* traveling using a *riya*. To prevent travelling back and forth in our *sansaara* we have to stop this *riya*. Therefore we must engage in *ariyapariyesana/ අරිය පරියේසන* (*Ariyapariyesana Sutta*: 2013). Lord Buddha was a person who completed his *ariyapariyesana*. Therefore people consider that the key personality of *Aaryans* is Buddha²⁸. It is evident through the foreward of *piruvaana poth wahanse/ පිරුවානා පොත් වනන්සේ* and *jeewhaaharanaya/ ජීවහාරණය*. If so, there is another circumstance occurred. That is 'it is not relevant to consider the term, *aara* in a simple way'. To find one's *aara*, a person should travel back to one's race/ *wanshaya*.

To identify what *swa* (ස්ව) is, that concept must be matched with the prevailing nature/ *dharmathawa*. Once again *dharmathawa* (ධර්මතාව) is the way of bearing something. Not by the standard but by the nature, if something is borne that is known as *dharmathawa*. The foundation of *dharmathawa* is the nature (ස්වභාව ධර්මය). *Swa + Bhaawa* (ස්ව + භාව) must be understood here. *Swa* can be described as *swakeeya/ ස්වකීය*, *swayanbhuu/ ස්වයංභූ* according to *Madhura Dictionary*³². *Bhaawa* is the *saara* or the standard. In other words this can be described as *swasaaraya* (ස්වසාරය), *swathathwaya* (ස්වතන්ත්වය), *swa bawa* (ස්ව බව), *swakeeya saaraya* (ස්වකීය සාරය), *swakeeya thathwaya* (ස්වකීය තන්ත්වය), *swakeeya bawa* (ස්වකීය බව), *swayanbhuu saaraya* (ස්වයංභූ සාරය), *wayanbhuu thathwaya* (ස්වයංභූ තන්ත්වය) and *swayanbhuu bawa* (ස්වයංභූ බව). Hence, should there be any *swayanbhuu* standard borne by anywhere that is considered as nature / *swabhawa dharma* (ස්වභාව ධර්මය). In other words, source of creating *swa bawa*, *swakeeya bawa* or *swayanbhuu bawa* is the nature/ *swabhawa dharma*. As a whole, given description for the concept of *thira saara* based on *pada nirukthi* method is presented through a figure (figure 1). Based on all these explanations, it is fair and rationalistic to consider that *thira saara* is the way of uncovering *swayanbhuu ariya* qualities. However, it must be noted that this given definition would only be understood once a person could have an analytical and comprehensive understanding of two concepts, such as *swaynbhuiu* qualities and *ariya* qualities.

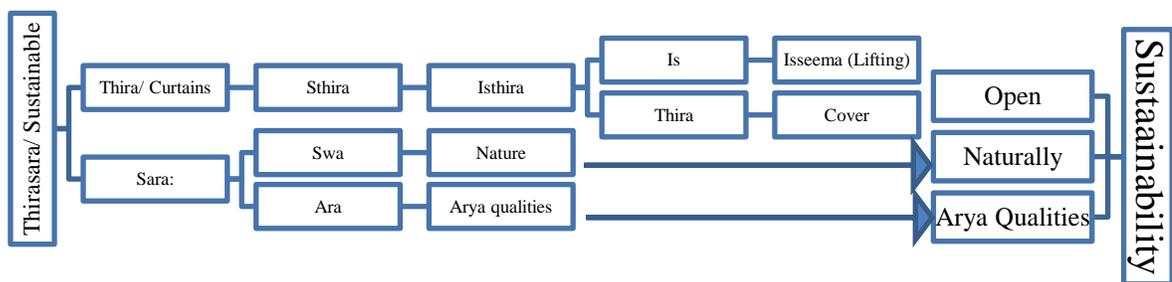


Figure 1: Pada Nirukthi use of Thirassara Definition

IV. CONCLUSION

This study was carried out to suggest a definition for the concept of *thirasaara*. To develop an appropriate background to achieve that objective; additional objectives were set, such as distinguishing the difference between definition and interpretation and suggesting a definition for definition. A source of Sri Lankan historical wisdom, which is known as *pada nirukthi* method was administrated to achieve the objectives mentioned above. It is more appropriate to consider current definitions that can be found in the literature for sustainability and sustainable development as interpretations rather than definitions. Should we consider those interpretations as definitions, the real meaning of *thira saara* would be depleted. Next, there was a successful effort in identifying the definition of definition. It is accurate to consider

the idea exactly generated or derived from a word (*nir + uktha*) is the definition of the definition. In other words, to find the most accurate definition of a word, a person should look into the *nirukthi* of a word. Finally, following the *nirukthi* method, a definition for the concept of *thira saara* was obtained. This definition has become unique as it was not an externally given interpretation. We used *pada nirukthi* method, and the definition was derived exactly within the *thira saara* word. Hence, we could prevent this definition for *thira saara* moving from another dimension of interpretation. Therefore, *thira saara* is the way of uncovering *swayanbhuu ariya* qualities.

The use of this definition must be aligned with the thing/ things' nature of where a person is going to apply the concept of *thira saara*. A 'thing' can be referred to any subject or object such as a society, country, building and park. For an example, suggested definition can be used as follows within a common framework.

යම් ජාතියක්	තුළින්	අරිය ගුණ	ඉස්මතු වේ	නම් එම ජාතිය තිරසාර වේ.
Should there are <i>ariya</i> qualities emphasized through a thing, that thing is <i>thirasaara</i> .				
	ස්වයංභූ	අරිය	නිරාවරණය	
	<i>swayanbhuu</i>	<i>ariya</i>	<i>uncover</i>	
	ස්ව	ආර	ස්ථිර (ඉස්තීර)	
	<i>swa</i>	<i>aara</i>	<i>sthira</i> (<i>isthira</i>)	
	සා	ර	තිර	= තිරසාර
	<i>saa</i>	<i>ra</i>	<i>thira</i>	= <i>thirasaara</i>

As such should there are *ariya* qualities emphasized within a park, that park is a *thirasaara* (sustainable) one. Should there are *ariya* qualities emphasized within a society, that society is a *thirasaara* (sustainable) society. Should there are *ariya* qualities emphasized within an organization, that organization is a *thirasaara* (sustainable) one. Should there are *ariya* qualities emphasized in a project, that thing is a *thirasaara* (sustainable) project. Accordingly, this study has fulfilled its objectives. Conclusion of this study has opened up new ways to another set of studies such as 1—analysis of definitions and interpretations through a new dimension, 2. Evaluate the definition of definition; 3. Evaluate the definition provided to *thirasaara* concept and carrying on further analysis using different approaches, 4, defining *Sawaynbhuru* and *Ariya* qualities and identifying elements of those concepts, 5 and carrying on further studies along with this novel method across diverse ranges of disciplines.

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Effect Of Process And Product Innovation On Financial Performance Of Savings And Credit Societies In Rwanda: A Case Study Of Umwalimu Sacco.

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DOI: 10.29322/IJSRP.10.09.2020.p10540

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10540>

Abstract- Financial innovation consists in the design, development, and implementation of innovative financial products, processes and services, and the adoption of innovative alternatives to address issues in finance. The purpose of this study was to establish the effect of product and process innovation on financial performance of Umwalimu SACCO in Rwanda. A census using a closed ended structure questionnaire to obtain both qualitative and quantitative data was conducted on 30 branch managers of Umwalimu SACCO across the country. The data thereof obtained was processed and analyzed for descriptive and inferential statistics by use of SPSS version 23. Correlation tests were run to determine the relationship between innovations and financial performance while, T-test was done to measure the significance of relationship. Findings of the study revealed that from 2013 to 2019, 5 loan products and 3 saving products were developed and introduced in Umwalimu SACCO. There was an increase of 91% and 87.5% in loan products and saving products respectively. Technology was also adopted, mainly mobile banking to make financial services more available, accessible and affordable to customers. 80% of respondents reported that withdrawal services were always provided to customers using internet banking. Regarding financial performance, a notable difference was observed in financial performance before and after innovations, that is by the year 2013 and 2019. The average number of customers increased from 1576.9 to 2458.9, uptake of financial services from 3701.8 to 11468.4, savings from the average of 841728960.9 to 1192124429.6, amount of loans provided from the average of 114506229.3 to 2104889250, and net profit from the average of 46670809 to 153758539.7. Correlation coefficients were strongly positive (.952) and P values (.000) allowed to reject null hypothesis and conclude that there was a significant relationship between innovations and financial performance. T-Tests (11.5) that are greater than the observed T value (1.645) and P value (.000) allowed to reject the null hypothesis and conclude that there was a significant different between financial performance of SACCO before and after the innovations.

Index Terms- Financial performance, innovation, product innovation, process innovation.

I. INTRODUCTION

Financial innovation which consists in creation of new types of financial firms, introduction of new products or significant improvement on the existing products and introduction of new of technology or improvement of production method; is generally regarded as a major determinant of performance and helps the firm to remain competitive while satisfying customers' dynamic demands. Specifically, moving to new markets, system readjustments, introducing new management techniques, new technologies like mobile telephone banking, internet banking, Automated Teller Machines (ATM) among others are achievements that depict financial innovation and help the organization enhance financial performance (Rouse, 2019).

The importance of innovation and devising new alternative answers that utilize data and digital technologies is of greater importance to SACCOs in taking action to address customer demands and maintain a competitive position in the dynamic market environment. Great focus is always put on digitizing important processes, introducing new products and improving the existing ones and reexamining institutional structures and internal talent to be better prepared for the future of the organization. (Marous, 2018). A Firms' financial performance is of great importance for any organization. For this reason, most companies are always reviewing their strategies on how they offer their products or services in order to keep up with demand and the competitive environment. Many firms especially in the financial institutions make use of financial innovation strategies to keep pace with changing environments (Arthur, 2017).

Innovation

The term innovation generally means a new way of doing something. It can be an idea, practice or object that is perceived as new by a unit of adoption (David G, 2011). This definition covers the diffusion of innovations as well as their initial creation and application. Innovation is usually understood to be distinct from invention. While invention is the first occurrence of an idea for a new product or process, innovation is the first attempt to carry it through into practice (David G, 2011). In increasingly integrated financial systems facing higher volatilities, more competition and wide varieties of risks, financial innovation has become an essence to provide new products and strategies to better suit different time

& market circumstances and to meet different requirements of participants in financial system.

Financial innovations arise due to several reasons. These include need to raise the number of customers, reduction in failure costs, mobilizing more savings and deposits, growing loan portfolio, increase profits, reduced managing costs, transparency and customization. A highly unstable environment leads to the best innovation which creates a unique competitive position and competitive advantage and leads to a high performance. (Hausman, Johnston, 2014).

Product and process innovations

According to Rouse (2019), process innovation is introduced in an organization to solve a problem or run a business in a completely different way to produce benefits to those who are carrying out the process or to the customers or both. The importance of process and product from financial innovation is observed by Merton (2011) as a method transforming to a competitive advantage, superior financial growth and consequently growth of a company. Despite the implication of financial innovation in elucidating performance in financial institutions, the impact of innovation on growth is misinterpreted in two ways; insufficient comprehension about the innovation triggers and poor testing of innovations' impact on development (Mabrouk & Mamoghli, 2010). Process innovation and product innovations are the main factors that have helped financial institutions to withstand aggressive competition in Kenya. Uptake of financial services by citizens has declined owing to issues of declining membership. SACCOs had to embrace process and product innovations to be able to compete with other competitors (Ngure, 2017).

Innovation and Financial performance of SACCOs

Financial performance refers to choices and practices both long and short-term which serve the same objective leading to a firm's growth by means of making sure that return on capital surpasses cost of capital, without minimizing expensive financial risks. Determinants of financial performance include return increasing membership, uptake of financial services, mobilization of more savings, growth of the loan portfolio, net profit, among others. This means that SACCOs whose financial performance is good make remarkable increments in numbers of members, mobilize more savings from members to finance loan provision, have increasing uptake of financial services by customers, experience growing loan portfolio, and increasing net profit. (Esokomi and Mutua, 2018).

In the present vibrant and competitive business environment, firms have to constantly develop products and introduce changes in order to meet the continuously varying needs and wants of client in order to exhaust the possibilities of achieving the expected objectives in terms volume of sales, market share, and profit. Product and process innovation that lead to quality and fast service, flexibility and high efficiency contribute to the firm's better financial performance. Product and process innovations offer a potential protection to a firm from market threats and competitors. A study conducted in Canada, ascertained that innovations had positive and significant link with financial performance of Credit and Savings Cooperatives. Therefore, it a conclusion was drawn that innovations aimed at

strengthening of operations are a key determinant of financial performance and gives additional discernment of the indirect effect of the specific elements of innovations on performance of SACCO (Coromel, 2016). Based on the findings of the study on innovations and financial performance in Kenya, Ngure (2017) recommended that SACCOs adopt innovations that include product innovations, process innovations and institutional innovations in order to improve financial performance.

SACCOs in Rwanda

SACCOs are the most important driver of rural economy in Rwanda because in most rural areas are the sole accessible financial institutions. The government of Rwanda created SACCOs, mainly Umurenge SACCO, a community based Savings and Credit Cooperative in order to attain a notable level of financial inclusion to contribute to the attainment of national sustainable economic development. In 2008, 416 Umurenge SACCO were created distributed over 416 administrative sectors to facilitate rural community members and low income people in general to have easy access to finance. Umwalimu SACCO was established in 2009 with 30 branches distributed over 30 districts across the country to facilitate access to finance to teachers and improve their welfare. In general SACCO were expected to promote accessibility, affordability and uptake of financial services in Rwanda. Saccos contributed to financial inclusion in Rwanda by making basic financial products/services including transaction banking, savings, credits, payments and remittances and other services proximate to people who may even be previously not served due to being located in a remote area. (Hategekimana, et al, 2019).

II. STATEMENT OF THE PROBLEM

Performance objectives for SACCOs in Rwanda include growing membership, mobilizing more savings, growing the loan portfolio, increasing uptake of financial services, and net profit among others. Performance of SACCO in general ever since they started has been poor and below expectation (BNR (2011) According to Munyaneza (2017) Saccos were advised to adopt financial innovations to withstand aggressive competition and attract more customers. It is in this regard, that Umwalimu Sacco resolved to embrace process and product innovations starting from 2013 to enhance service quality in order to attract more customers. Ever since, the efforts of innovation were implemented, no empirical evidence existed to indicate how the innovations were adopted and how process and product innovation this could be linked with financial performance of the Sacco. Therefore this study seeks to bridge that gap by investigating the innovations adopted in Umwalimu Sacco and measuring the link between innovations and financial performance, hence justification for this study.

Empirical review

A study by Gunday, Ulusoy, Kilic & Alpkan (2011) on the effects of innovations on firm's performance, attempt to find the effect of the organizational, process, product and marketing innovations on the different aspects of firm's performance including innovative, production, market and financial

performances, based on an empirical study covering 184 manufacturing firms in Turkey. The results displayed positive effects of innovations on firm performance in manufacturing industries. An empirical study by Lin (2013) on SMEs in Taiwan exposed that the business and marketing performance of the firm is determined by its innovation ability and ultimately influence on financial performance. Tabas & Beranova (2012) tried to find possible effect of product innovations on the financial performance of small and medium sized enterprises in the Czech Republic. The results showed that continuous innovations are needed according to their pilot study of statistical sample of 100 companies.

An exploratory research on 43 commercial banks in Kenya by Frame, Scott, and Lawrence J. White, (2012) on the effects and the determinants of financial innovation on bank performance confirmed that a strong competition and technology are the major drivers of financial innovation. Njeri (2013), on her study on the effects of financial innovation on the financial performance of deposit taking SACCOs in Kenya, found that there is a positive relationship between financial innovation and financial performance. Findings of Ngure (2017) on financial innovations and performance of Sacco's correspond to the findings of Njeri (2013) and based on the findings he recommended that SACCOs adopt innovations that include product innovations, process innovations and institutional innovations in order to enhance operations and improve financial performance.

A study conducted by Muyitz (2013) and Tuma, (2016) on process innovation on SACCOs in Thailand and Bangladesh respectively in revealed successful SACCOs adopted new and novel technologies in order to improve delivery of services to their clients. Such technologies included ATM (Automated Teller Machine), Internet banking and mobile phone banking. The studies concurred that adoption of the technologies together with improvements made in the provision of services contributed to a greater extent to financial performance of the SACCOs and thus confirmed a positive significant association between adoption of innovations and financial performance of Saccos. A study conducted in Canada by Colomel, (2016) ascertained that innovations had positive and significant link with financial performance of Credit and Savings Cooperatives and concluded that innovations aimed at strengthening of operations are a key determinant of financial performance.

III. METHODOLOGY

A census using a closed ended structure questionnaire to obtain both qualitative and quantitative data was conducted on 30 branch managers of Umwalimu SACCO across the country. The data thereof obtained was processed and analyzed for descriptive and inferential statistics by use of SPSS version 23. Correlation tests were run to determine the relationship between innovations and financial performance while, T-test was done to measure the significance of relationship

IV. RESULTS AND FINDINGS

Socio-demographic information of respondents

Social demographic information as indicated in Table1, include age, gender, education, marital status, and experience of the respondents. This study revealed that age ranges between 25-35 years for majority 60% of the respondents, while a minority 40%, were aged between 36 and 45 years. The results suggest that that most respondents are still young and energetic. Further, 60% of the respondents were males with a majority 80% having attained a bachelor's degree. This gives an impression that all respondents were qualified to carry out their responsibilities. The results further reveal that 67% of the employees had a working experience of 5 to 7 years while 33% had served for 8 and more years. The foregoing results imply that a majority of the UMWALIMU SACCO employees had a lot of experience and hence, knowledgeable enough to offer reliable and valid information required for the current study.

Table 1: Socio-demographic information of respondents

Variable	Frequency	Percentage
Age [Average:33.5]		
25-35	18	60
36-45	12	40
Gender		
Male	18	60
Female	12	40
Education		
Bachelor's	24	80
Master	6	2
Marital status		
Married	26	65.7
Single	4	13.3
Work experience in years [average:6.96]		
5-7	20	66.7
8-9	10	33.3

Source: Primary data

Process innovation

The study sought to identify process innovations that were adopted in Umwalimu Sacco. Specifically, the study sought to know the how modern technology was adopted and identify process improvements that were introduced to make financial services more available, accessible and affordable to enhance financial performance of the institution.

a) Ownership of computer and access to internet

The study sought to understand if respondents had a computer at work and if they used internet in provision of financial services to the members of Umwalimu Sacco. Findings revealed that all respondents had a computer in their offices, and had access to internet connection. Access to electronic device and internet connection is a primary requirement to improve on the process of provision of financial services

Table 2: Ownership of computer and access to internet

Variable	Frequency	Percentage
Owning a computer	30	100
Internet connection in provision of services	30	100

Source: Primary data

b) Connectivity and use of technology in provision of services to customers

Results in table 3, presents information on how respondents rated their connectivity to internet and how they used technology in provision of various financial services to the members. As regards connection, a majority 57% of the respondents confirmed that they were connected to internet most times, whereas 43% reported that they were always connected to internet. 90% of respondents reported that they always used internet in provision of deposit transactions services. 83.3 % reported that internet is used in providing withdrawal services to the members. All branches always use internet to access CRB (Credit Reference bureau) information on every member of SACCO, use internet to make money transfers, and to access any customer’s account details for different purposes.

Table 3: Connectivity and use of IT-technology in Service Delivery.

Variable	Frequency	Percentage
Always connected	13	43.3
Most times connected	17	56.7
Use of connection in deposit transactions		
Always	27	90
Most times	3	10
Use of connection in withdrawal transactions		
Always	25	83.3
Most times	5	16.7
Use of internet connection access CRB info		
Always	30	100
Use of internet connection to make transfer		
Always	30	100
Access to customers details		
Always	26	86.6%
Most times	4	13.3

c) Use of ATM and Internet Banking

The study sought to understand how these technology (Automated Teller Machine and Internet Banking) were adopted in Umwalimu SACCO. These are technologies that makes access to financial services more accessible at the customers’ convenience be it in terms of time, location, etc. the study revealed that ATM and Internet Banking had not yet been adopted by Umwalimu SACCO.

i) Mobile banking

Results in table 4; indicate that a 80% majority of the respondents reported that withdrawal services are provided to customers using mobile banking. Implying that members of the

Umwalimu SACCO could access cash without going to the branch offices for the same service. Further, the same level of members revealed that they could conduct cash transfers using mobile money. The results further revealed that an overwhelming 73% of the respondents applied and received loans through mobile banking.

Table 4: Mobile banking

Variable	Frequency	Percentage
deposit services provided using mobile banking		
Not at all	30	100
Withdrawal services provided using mobile banking		
Always	24	80
Most times	4	13.3
Sometimes	2	6.7
Money transfer services provided through mobile banking		
Sometimes	24	80
Rarely	6	20
Checking loan status service		
Most times	23	76.7
Sometimes	7	23.3
Check account balance service		
Always	30	100
Bank statement requests through mobile banking		
Sometimes	20	66.7
Rarely	9	30
Most times	1	3.3
Loan requests (overdraft)		
Most times	22	73.3
Sometimes	8	26.7
Alerts, SMS to members		
Always	30	100

D) Product innovation

The study sought to identify all loan and savings new products and improvements on the products that existed by the year 2013 and by 2019.

i) Loan products by 2013 and by 2019

This study found out that by the year 2013, there were 6 loan products available to Umwalimu Sacco customers including mortgage loan, emergency loan, salary advance, business loan, overdraft loan and one laptop per teacher loan product, whereas by the year 2019 11 loan products were available to customers. Five new loan products were developed and introduced in Umwalimu SACCO. The number of products increased represent 91% increase which is a remarkable step in loan product innovation. These new loan products are school fees loan, medical loan, home furniture, agriculture and livestock, and vehicle and asset loan.

Table 5: Loan products developed between the years 2013 and by 2019

SN	Loan products by 2013	Loan products by 2019
1	Mortgage loan	Mortgage loan
2	Emergency loan	Emergency loan
3	Salary advance	Salary advance
4	Business loan	Business loan
5	Overdraft loan	Overdraft loan
6	One laptop per teacher	One laptop per teacher
7		School fees loan
8		Medical loan
9		Home furniture
10		Agriculture and livestock
11		Vehicle and asset loan

Source: Umwalimu SACCO

ii) **Loan products offered to customers by 2013 and 2019 in the 30 branches**

Results in table 6; Indicate that a majority 83% reported that customers accessed all the 6 loan products that existed by 2013 while, 87% reported that the members of SACCO accessed all eleven loan products by the year 2019. Having a good number of loan products indicates that the SACCO has designed products that suits the demands of the members, which in turn may positively affect uptake of financial services and eventually lead better financial performance.

Table 6: Loan products that were offered

Period	Number of loan products	Frequency	Percent
By 2013 [average: 5.83]	5	5	16.7
By 2019 [average: 10.83]	11	26	86.7

Improvements on loan services

Results in table 7; show that the average number of months it took to provide mortgage loan by 2013 was 6.67, whereas the average months it took by the year 2019 was 1.2. This is a very remarkable decrease in the period it takes to provide mortgage loans. 86.7% of respondents reported that by 2013, providing mortgage loan took 5 to 7 months, whereas 80% of respondents reported that they could only take one month to provide mortgage loan to the members. All respondents reported a decreasing number of requirements for getting a mortgage loan from 8 to 5 requirements. The decrease obviously means that access to mortgage loan was made easier to the members than before. For emergency loan, the average number of days it took to get the loan was 2.76 by 2013, which declined to 1 day by 2019. This study further revealed that salary advance loan could take averagely 12.3 days by 2013, which decreased to 2.5. the number of requirements to get a salary advance loan reduced from 7 to 4 days. The average number of months it took to get a business loan by 2013 was 3.2,

and this reduced to 1 month by the year 2019. The number of requirements decreased from 6 by 2013 to 4 by 2019. The average number of hours to get overdraft loan by 2013 was 28.6 days, which decreased to 1.4 hours by 2019.

Table 7: Improvements on loan services

Value	Frequency	Percent
Months takes to provide mortgage loan by 2013 [average:6.63]		
5-7	26	86.7
8-9	4	13.3
Months takes to provide mortgage loan by 2019 [average:1.2]		
1	24	80
2	6	20
Number of requirements for mortgage by 2013		
8	30	100
Number of requirements for mortgage by 2019		
5	30	100
Days emergency loan by 2013 [average: 2.76]		
2	9	30
3-4	21	70
Days emergency loan by 2019		
1	30	100
Number of requirements emergency by 2013		
4	30	100
Number of requirements emergency by 2013		
2	30	100
Days to provide salary advance loan 2013 [average:12.3]		
8-12	15	50
13-15	15	50
Days to provide salary advance loan 2019 [average:2.5]		
1-2	16	53.3
3-4	14	46.6
Number of requirements salary advance 2013		
7	30	100
Number of requirements salary advance 2019		
4	30	100
Months for business loan 2013 [average:3.2]		
3	22	73.3
4	8	26.7
Months for business loan 2019 [average:1]		
1	30	100
Requirements business loan 2013		
6	30	100
Requirements business loan 2019		
4	30	100
Hours to provide overdraft loan 2013 [average:28.6]		
12-24	13	43.3
25-48	17	57.7
Hours to provide overdraft loan 2019 [average:1.4]		
1	18	60
2	12	40

Savings products by 2013 and by 2019

Variable	Frequency	Percent
Number of members2013 [1576.9]		
1100-1500	11	36.7
1501-2350	19	63.3
Number of members2019 [2458.9]		
2100-2500	19	63.3
2501-3250	11	36.7

Results in table 8; revealed that by the year 2013, there were 4 saving products including free saving, permanent savings, school fees saving, and funeral solidarity fund. The number

Variable	Frequency	Percent
Uptake 2013 [average:3701.8]		
2990-3500	12	40
3500-4560	18	60
Uptake 2019 [average: 11468.4]		
8000-12000	14	46.7
12001-14500	16	53.3

increased to 7 saving products by 2019. 3 saving products were introduced including home furniture saving, fixed-deposit and children's saving products. The number of increment of saving products represent a percentage of 87.5 which is a notable effort to customize savings services.3

Table 8: Savings products by 2013 and by 2019

SN	Savings products by 2013	Savings products by 2019
1	Free saving	Free saving
2	Permanent saving	Permanent saving
3	School fees saving	School fees saving
4	Funeral solidarity fund	Funeral solidarity fund
5		Home furniture saving
6		Fixed deposit
7		Children's savings account

Source: Umwalimu SACCO website

Financial performance

This study sought to determine financial performance of Umwalimu SACCO by 2013 and by 2019. A number of variables were measured to indicate performance.

Members of Umwalimu SACCO

One of the key indications of performance is a growing membership of a SACCO. It is a primary condition for a Savings and Credit Cooperative for financial performance. The table below presents information on members of Umwalimu SACCO by 2013 and by 2019. It was revealed that the average number of members was 1576 by the year 2013 and 2459 by 2019. As observed, there exists a notable difference between the average number of members by 2013 and the average number of customers by 2019. For 19 branches representing 63.3%, the number of members

ranged between 1501 and 2350, whereas it ranged between 2100 and 2500 for majority of branches by the year 2019.

Table 9: Members of Umwalimu SACCO

Source: UMWALIMU SASCCO 2019

Uptake of financial services (loans)

Apart from withdrawal, cash deposits services, uptake of loans by customers is a key indication of uptake of financial services by customers. The table below presents information on uptake of loans which represents the general uptake of financial services by members of Umwalimu SACCO. The study reveals that the average uptake of loans was 3701.8 by 2013 whereas the uptake raised to 11468.4 by the year 2019. Majority of respondents representing 60%, reported that loan uptake by customers ranged between 3500-4560 by 2013, whereas 53.5 % of respondents reported that the loan uptake ranged between 12001 and 14500. This indicates that there is a big difference between loan uptake by 2013 and loan uptake by the year 2019. This could be a result of innovations made on loan products, new products introduced and adoption of technology to improve service provision.

Table 10: Uptake of financial services

Savings by 2013 and savings by 2019

Results in table 11; presents information on savings by 2013 and by 2019. The average savings per each branch was RWF 841728960.9 by the year 2013 which increased to RWF 1192124429.6 by 2019. Comparing the two means we see a very notable increase in the amounts of savings. By 2013, for majority of Umwalimu SACCO branches which represents 60% savings ranged between 410000001- 500000000. It was further revealed that for majority of respondents which represents 50%, savings by 2019 ranged between 1029392922 and 1329292880.

Table 11: Savings by 2013 and 2019

Variable	Frequency	Percent
Savings by 2013 [average:841728960.9]		
324502020-350000000	7	.3
350000001-410000000	5	16.5
410000001-500000000	18	60
Savings by2019 [average:1192124429.6]		
769979287-1019103830	9	30
1029392922-1329292880	15	50
1423392202-1762838383	6	20

Loans provided

This study sought to find found out the amount of loans were provided to the members by 2013 and by 2019. It was found out that the average loans provided by 2013 was 1145062294.3 which increased to the average loan amount of 2104889250 by the year 2019. 19 respondents representing 63.3% reported that their

amount of loan provided by 2013 ranged between 587873738 and 989498722, whereas for 2019, 80% reported that the amount of loans provided ranged between 20000000001 and 26000000000.

Table 12: Loans provided

Variable	Frequency	Percentage
Loans provided by 2013 [average: 1145062294.3]		
587873738-989498722	19	63.3
1034202002-1984947400	11	36.7
Loans provided by 2019 [average: 2104889250]		
1019103900-2000000000	6	20
200000000001-260000000000	24	80

Net profit by 2013 and 2019

This table presents information on net profit by 2013 and 2019. Findings revealed that the average amount of net profit was 46670809 by 2013 and 153758539.7 by 2019. For majority of respondents, which is 16 representing 53.4 the net profit ranged between 40987367 and 44985764 by the year 2013; whereas it ranged between 163820900 and 199873720 for 53.3% of respondents by 2019.

Table 13: Net profit by 2013 and 2019

Variable	Frequency	Percent
Net profit by 2013 [46670809]		
38729980-41200000	7	23.3
40987367-44985764	16	53.4
45209879-52000000	7	23.3
Net profit by 2019 [153758539.7]		
90270800-149829300	14	46.7
163820900-199873720	16	53.3

Inferential Statistics

Inferential analysis was used to produce correlation and T and Critical values to measure the relationship between independent and dependent variables and significance of the difference when comparing two situations: financial performance by the year 2013, and by the year by 2019.

Relationship between process innovation and financial performance

Correlation results indicated that the correlation coefficient was .952** and P value .000 which is less than the significance level of .05. Therefore, a conclusion was made that there existed a significant relationship between process innovation and financial performance in Umwalimu SACCO and a decision to reject the null hypothesis was made.

Table 14: Relationship between process innovation and financial performance

		Process innovation	Financial Performance
Process innovation	Spearman correlation	1	.952**
	Sig. (2-tailed)		.000
	N	30	
Financial performance	Spearman Correlation	.952**	1
	Sig. (2-tailed)	.000	30
	N		

** . Correlation is significant at the 0.01 level (2-tailed).

Relationship between product innovation and financial performance

Correlation results indicated that the correlation coefficient was .747** and P value .000 which is less than the significance level of .05. Therefore, a conclusion was made that there existed a significant relationship between product innovation and financial performance in Umwalimu SACCO and a decision to reject the null hypothesis was made.

Table 15: Relationship between product innovation and financial performance

		Process innovation	Financial Performance
Process innovation	Pearson correlation	1	.747**
	Sig. (2-tailed)		.000
	N	30	
Financial performance	Pearson Correlation	.747**	1
	Sig. (2-tailed)	.000	30
	N		

** . Correlation is significant at the 0.01 level (2-tailed).

Significance of the difference in terms of performance between two periods (T-test Analysis)

Table 16; presents the results of T-test analysis to measure if there existed a significant difference between performance of 2013 and performance of 2019 as a result of process and product innovation.

Members and uptake of financial services by 2013 and by 2019

Results in 16; presents the results of t-test on the significance of the difference between the members of sacco and uptake of financial services by 2013 and by 2019. The results indicate that the P values (.000, .000) for both variables were less than the level of significance (.05) and the calculated T values (11.05,28.8) which were greater than the observed T-values

(1.64). Therefore, a conclusion was made that there existed a significant difference between members of sacco by the year 2013 and members of sacco by the year 2019, and there existed a significant difference between uptake of financial services by 2013 and uptake of financial services by 2019.

Table 16: Difference between members and financial uptake before 2013 and in 2019.

Independent Samples Test				95% confidence Interval of the difference					
				F	Sig	T	Df	Sig (2-tailed)	Mean difference
Members 2013 and 2019	Equal Variances Assumed			.94	.760	11.050	58	.000	882.00000
				47.126		11.050	56.802	.000	882.00000
Uptake of financial by2013	Equal Variances Assumed			20.307		28.8	58	.000	72291.14
						28.7	37.7	.000	7222.6

Savings, loans provided and net profit

As shown in table 17; the P values (.000, .000, .000) for both variables which were less than the 0.05 level of significance (.05) and the calculated T values (17.20,21.3, 23.19) which were greater than the observed T-values. Therefore, a conclusion was

made that there existed a significant difference between Savings of sacco by the year 2013 and savings of sacco by the year 2019, and there existed a significant difference between loans provided by 2013 and loans provided by 2019.

Table 17: Savings, loans provided and net profit

Independent Samples Test				95% confidence Interval of the difference					
				F	Sig	T	Df	Sig (2-tailed)	Mean difference
Savings2013 2019	Equal Variances Assumed			.84	.82	17.20	58	.000	350395
				49.567		17.20	56.802	.000	
Loansprovid ed20132019	Equal Variances Assumed			.87	.980	21.3	58	.000	959826E
Net profit	Equal Variances Assumed			.96	.897	23.19	58	.000	107091E

V. DISCUSSION OF THE FINDINGS

The current study confirmed a significant relationship between process and financial performance of Umwalimu SACCO. The results concur with Gunday, Ulusoy, Kilic & Alpkan (2011), Lin (2013) and Tabas & Beranova (2012) who posited that the business and marketing performance of the firm is determined

by its innovation ability and ultimately influence on financial performance. This study found out that ATM and internet banking had been adopted and used in Umwalimu SACCO with significant improvements in delivery of services to the clients. Similar studies by Muyitz (2013) and Tuma, (2016) in Thailand and Bangladesh respectively confirmed a positive significant association between

adoption of innovations and financial performance of Saccos. Thus, support the current findings.

VI. CONCLUSIONS AND RECOMMENDATIONS

This study revealed that process and product innovations were adopted in Umwalimu SACCO. Technology that included mobile banking, computerization of the system, and reducing the period it takes to get a loan, reducing the number of requirements for loan applicants, were some of the changes made to improve service provision. Based on the correlation analysis results, it was concluded that there exists a strong significant relationship between process and product innovation and financial performance. Based on T-Statistics, a conclusion was made that there is a significant difference between financial performance by 2013 and financial performance by 2019.

VII. RECOMMENDATIONS

Based on the key findings the study recommends that all SACCOs in Rwanda sensitize members on using mobile banking for different services in order to reduce the number of people queuing on banking halls for services. Moreover, the SACCOs are advised to improve mobile banking services so that members can deposit money on their account using their mobile phone. This will reduce the time and cost incurred when members travel to the SACCO for depositing money. It is imperative that SACCOs conduct a needs assessment to gauge the demand for ATM and internet banking for purposes of enhancing uptake of the same.

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Glyphosate Effects on the Growth, Yield and Protein Concentration of Groundnut (*Arachis hypogaea*) In Jos Metropolis

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DOI: 10.29322/IJSRP.10.09.2020.p10541

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10541>

Abstract: This experiment was conducted at Federal College of Forestry, Jos to determine the effect of glyphosate herbicide on the growth and yield parameters as well as the protein concentration of groundnut (*Arachis hypogaea*). The experiment consist of Randomized Complete Block Design (RCBD) where four treatments were involved in which the control (T₀) is without glyphosate, while T₁, T₂, and T₃ contained 4ml, 6ml and 8ml of glyphosate herbicide per 100ml water solution respectively applied per 4m² experimental plot. The treatments were replicated four times. The herbicide was applied to the plots three times with the control weeded using hoe. Biuret method of protein analysis was also used to determine the protein concentration of the yield. Analysis of variance (ANOVA) was used to analyze the results and where differences occur among the means, Duncan Multiple Range Test was used to separate the means. Parameters such as plant height, leaf count, stem girth, number of flowers, yield and protein concentration were examined. The result indicates that significance difference occur in the plant height and leaf count with T₀ having the highest mean value 22.98 (plant height) and 275.24 (leaf count). T₀ recorded the highest mean value of 2.42 for stem girth and 28.30 for number of flowers. The yield as well as the protein concentration also recorded significant results with the highest mean values occurring in T₀ with values of 0.354 and 13.53 respectively. This result is an indication of the effects glyphosate herbicide exhibit on the growth, yield parameters and protein concentration of groundnut.

Keywords: Glyphosate, Groundnut, Growth, Protein concentration, Yield.

INTRODUCTION

Groundnut (peanut) (*Arachis hypogaea* L.) is one of the world's most popular oil seed crops which is grown as an annual plant but perennial growth is possible in climates which are warm until harvest. Groundnut can best be grown on a well-drained sandy, loamy or sandy clay loam soil with a pH of 5.5-6.0 and high soil fertility are ideal for groundnut (Aparna *et al.*, 2013). Cultivated groundnut (*Arachis hypogaea* L.) belongs to the genus *Arachis* in the sub-tribe Stylosanthinae of the tribe Aeschynomeneae and family of leguminosae. It is a self-pollinated, tropical annual legume. Groundnut is grown on 26.4 million hectare worldwide, with a total production of 37.1 million metric tonnes and an average productivity of 1.4 metric tons /ha (Kurrey and Jain, 2018). Groundnut is an excellent source of plant nutrients, it contains 45-50% oil, 27-33% protein as well as essential minerals and vitamins (Ahmed *et al.*, 2011) with some dietary fibres in small quantity. The nutrient found in groundnuts, including folic acid, phyto-sterols, phytic acid and resveratrol have anti-cancer effects (Gayathri, 2018).

Developing countries in Asia, Africa and South America account for about 97 % of World groundnut area and 95% of total production (Johnny *et al.*, 2014). Nigeria is the third highest producer of groundnut in the world after China and India with a production of 16,114,231, 6,933,000 and 2,962,760 tons respectively (FAO, 2001). Groundnut has contributed immensely to the

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10541>

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development of the Nigerian economy. From 1956 to 1967, groundnut products including cake and oil accounted for about 70% of total Nigeria export earnings, making it the country's most valuable single export crop ahead of other cash crops like cotton, oil palm, cocoa and rubber (Harkness *et al.*, 1976).

In groundnut production, weeding is important between 4 to 8 weeks after sowing (Santelmann and Hill, 1969) in order to have a good crop yield. Nutrient losses due to crop-weed completion has been described to be about 38.8, 9.2 and 23.3 for each of Nitrogen, Phosphorus and potassium in kg ha^{-1} respectively (Naidu *et al.* 1982). As necessary as weeding is, it is regarded as one of the most tedious farm works. The establishment of chemical herbicides has brought a great relief to farmers. Herbicides can do works that over 100 farmers will do and their effects are more lasting than the use of mechanical methods of weeding. However, their residual effects can cause great damage to living organisms.

Glyphosate with the chemical name [*N*-(phosphonomethyl) glycine] is the most broadly used herbicide worldwide since the introduction of glyphosate-resistant (GR) plants (Coupe *et al.*, 2012). The high solubility of glyphosate has brought about some concerns on its possible environmental effects despite the report on its safety on animals and humans (Cerdeira and Duke, 2006). Despite the importance of this herbicide, it has been reported to interfere with the uptake of essential minerals in agricultural crops. One of the mechanism of reaction of glyphosate is to block an enzyme called 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) that plants need to make amino acids and protein (Hoagland and Duke, 2002). Shikimic acid is an important intermediate that is essential in the biosynthesis of aromatic amino acids (phenylalanine, tyrosine, tryptophan) as well as in the synthesis of some secondary metabolites like alkaloids, flavonoid, lignin and aromatic antibiotics. Glyphosate in its action, binds tightly to EPSPS and therefore prevents the binding of the enzyme to its substrate (Jasim *et al.*, 2016). This therefore inhibits the production of some essential nutrients and the secondary metabolites produced from shikimate biosynthesis. In view of this, this study is aimed at investigating the effect of glyphosate herbicide on the growth, yield as well as the protein concentration of groundnut (*Arachis hypogaea*).

MATERIALS AND METHODS

Study Area

The experiment was conducted at Federal College of Forestry, Jos. The College lies between Southern humid regions of Guinea Savannah ecologically zone of Nigeria with temperature range between 10° and 32° depending on the season of the year. It is of latitude 9.56°N and 8.53°E in the middle belt of Nigeria. It has a cool climatic condition with a sandy loamy soil (Pam, 2009).

Method

The experimental site was cleared and debris were removed. The plots were properly randomized, using Randomized Complete Block Design and were then measured. The beds were constructed with proper mixing of the soil before demarcating each plot.

Herbicide Application

Glyphosate herbicide was applied before the crop was planted after seed bed preparation. The treatments consist of four different application rates of the herbicide. The control treatment was weeded manually without the use of the herbicide. The second treatment consists of 4ml of glyphosate in 996ml of water to make up 1000ml solution. The third treatment consist of 6ml of glyphosate in 994ml of water and the last treatment consist of 8ml of glyphosate in 992ml of water.

Planting operation

The groundnut was planted by drilling method on a flat seed bed with sandy loamy soils. Groundnut was planted by sowing at a distance of 15cm between plants and 30cm between rows with the use of small hoe, 3 seeds per hole was planted but later reduced to two per stand.

Protein Analysis

The protein analysis was carried out using Biuret method. Prior to the laboratory analysis, the groundnut sample was pulverized using an electric blender and 1g of the sample was weighed using a weighing balance (HX 302T). The sample was suspended in 10ml of 70% ethanol and the oil washed off with 1ml petroleum ether to prevent interference. 4ml biuret reagent was added to 1ml of the 10 fold diluted sample. The mixture was rapidly cooled and the optical density was read using a spectrophotometer at a wavelength of 280nm wavelength.

Results and Discussion

Plant Height

The result obtained shows that the plant height differed across the different groups and it is based on the level of glyphosate herbicide applied. It was indicated in the result (Table 1) that there is significance difference in the plant height for the different treatments used. The highest mean value was observed in the control with the second highest occurring in T₁ (22.15). The effect of the herbicide however showed the most in the group with the highest glyphosate with mean value (21.78). Simic *et al.* (2011) explained that

application of flurochloridone combined with s-metolachor produced an effect in the height of sunflower when different varieties were grown.

Table 1: Effect of Glyphosate herbicide on the growth parameters of groundnut (*Arachis hypogaea*)

Treatments	Plant Height (cm)	Leaf Count	Stem Girth
T ₀	22.98 ^a	275.24 ^a	2.42 ^a
T ₁	22.15 ^b	273.76 ^a	2.24 ^b
T ₂	21.99 ^b	254.48 ^b	2.24 ^b
T ₃	21.78 ^b	255.69 ^b	2.25 ^b
S.E.M	0.18	3.54	0.02
L.S	*	*	*

Means in the same column having the same superscript are not significantly different at 5% level of probability

Leaf Count

The leaf count of the *Arachis hypogaea* clearly shows that the different concentrations of the glyphosate herbicide have negative effects on the number of leaves (Table 1). The result shows that significant difference occurs among the different treatments. The highest mean value occur in T₀ (275.24) with the second highest occurring in T₁ (273.76). The reduction in the number of leaves in T₂ and T₃ could be as a result of glyphosate's effect on the rate of photosynthetic activities. Glyphosate has been reported to inhibit chlorophyll biosynthesis (Fedtke and Duke, 2005) and it can as well stimulate the degradation of chlorophyll in the photosynthetic units of plant. The inhibition of the major photosynthetic components in plant, which is chlorophyll brings about conservation of the inherent nutrients in plants hence, reduction in the number of leaves by T₂ and T₃.

Stem Girth

The Stem girth of the different treatments shows differences in the values obtained (Table 1). These differences were found to be significant between the control and the experimental units. The highest mean value occurred in the control (2.42). T₁, T₂ and T₃ have mean values 2.24, 2.24 and 2.25 respectively. The three treatments are however not significant from one another. They are however statistically similar to one another even despite the differences in the values between T₁, T₂ and T₃. The observed differences in the collar girth between the experimental treatments and the control could be due to mechanism of action of glyphosate in disrupting plant growth. Glyphosate penetrates the plant tissues, after translocation through the vascular tissues (Satchivi *et al.*, 2000) and hence alter the lateral meristem growth, the cell responsible for stem tissue expansion. This result is similar to that of Obidola *et al.* (2019) in which significant difference was reported in cowpea seeds treated with cypermethrin pesticide before planting.

Table 2: Effect of glyphosate herbicide on the yield parameters of groundnut (*Arachis hypogaea*).

Treatments	Number of Flowers	Yield (kg/m ²)
T ₀	28.30 ^a	0.354 ^a
T ₁	26.46 ^b	0.314 ^b
T ₂	21.18 ^c	0.310 ^b
T ₃	19.14 ^d	0.255 ^c
S.E.M	0.42	2.42
L.S	*	*

Means in the same column having the same superscript are not significantly different at 5% level of probability.

Number of Flowers

The mean values for the number of flowers shows that differences occur among the different application rates of glyphosate herbicide as observed in table 2. The differences are seen to be significantly different from one another as indicated in table 3. The highest mean value is as observed in the table above (28.30) indicative of no glyphosate effect in the control. However, treatments T₁, T₂ and T₃ have mean values 26.46, 21.18 and 19.14 respectively which shows that the number of leaves obtained is in accordance with the herbicide application rates. Glyphosate affect flower formation by affecting the major components involved in the flower such as the anther and the petals there by shrinking the flowers inhibiting the formation of new flowers. The result stated here is in line with the published work by Londo *et al.* (2014) which states that glyphosate application to *Brassica rapa* and *Brassica nigra* significantly reduced the duration of flowering.

Yield

The yield obtained for the different treatments are reflective of the glyphosate effect. Significant difference occur in the different treatments (Table 2). T₁ (0.354) is significantly different from the control and from T₂ and T₃ whose mean values are 0.310 and 0.255 respectively. The yield obtained from each treatment are reflective of the various concentrations used. The differences in the yield obtained for each of the treatments could be as a result of the growth and yield parameters as exhibited by the plants as observed in the other results above. This result is a confirmation of the earlier published work by Ghosheh *et al.* (2002) in which there was a significant reduction in the yield (64-84%) of sorghum and corn that were treated with pyrithiobac herbicide. Similarly, O’Sullivan and Thomas, (2001) reported about 22% and 13% reduction in the yield of cabbage and pepper respectively after treatment with sulfonyl urea herbicide CGA 152005.

Protein Content

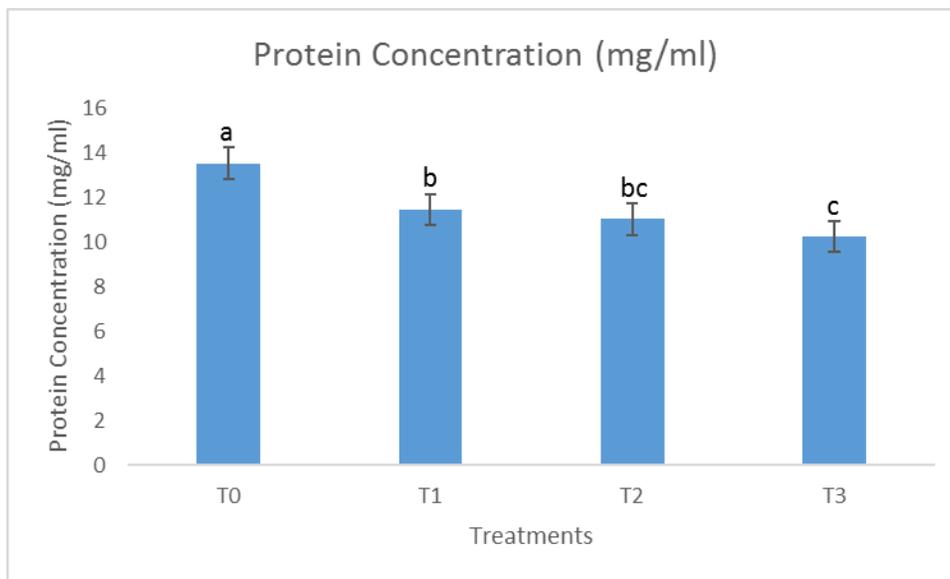


Figure 1: Effect of glyphosate herbicide on the protein concentration of groundnut (*Arachis hypogaea*).

Figure 1 shows the effect of the glyphosate herbicide on the protein concentration of *Arachis hypogaea*. The result shows that protein concentration decreases with increasing application rate of glyphosate herbicide. Significant difference is observed to occur among all the treatments. The highest mean value occur in the control (13.53mg/ml), followed by T₁ (11.45mg/ml) as the second highest. The lowest mean value occur in the plot with the highest glyphosate application rate (10.24mg/ml). T₁ and T₂ are seen to be statistically similar and likewise, T₂ and T₃ are also observed to be statistically similar to each other. This implies that the glyphosate herbicide inhibited the normal protein synthesis and this is in line with the work of Hoagland and Duke (2002) which states that glyphosate’s main effect is to block an enzyme that plants need to make amino acids and protein.

Conclusion

The treatment that was weeded manually (T₀) shows difference from the other treatments. In term of plant height and stem girth, the effect of the applied herbicide was noticed when compared with the control. The result from the leaf count however did not show any difference between the control and treatment T₁, although, differences were observed between the control and T₂ and T₃. The yield parameters also shows that differences occur between the control and the other treatments when observing the number of flowers and the yield. Glyphosate effect also show in the result of the protein concentration. Based on these results, glyphosate application at these could have an impact on the growth and yield parameters as well as protein concentration of groundnut. Further research is encouraged to be conducted especially on the effect of glyphosate on the constituent amino acids that are found in groundnut.

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Knowledge, attitudes, practices among private practitioners regarding Tuberculosis patient screening in Kaluthara district Sri Lanka: A cross sectional study

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DOI: 10.29322/IJSRP.10.09.2020.p10542

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10542>

Institutional Review Board approval

This study was approved by the Ethics Review Committee of Post Graduate Institute of Medicine, University of Colombo with a waiver of informed consent (ERC/PGIM/2018/151).

Abstract-

Background

Tuberculosis (TB) is one of the 10 leading causes of death worldwide. In Sri Lanka, approximately one third of cases are not detected during routine practice. Poor contact tracing, inadequate detection, underutilization of MCs are major weakness in TB screening. The private sector provides 50% of outpatient services of Sri Lanka and this study aims to assess Knowledge, attitudes, practices among Private Practitioners (PPs) on TB patient detection and treatment in Kaluthara district Sri Lanka.

Methods

A descriptive cross-sectional study carried out among 153 PPs in Kaluthara District. Knowledge and Attitudes of PPs were assessed using Self-Administered Questionnaire (SAQ) and Practices were assessed using open ended questions based on three clinical vignettes related to TB.

Results

Majority of PPs have satisfactory level of knowledge on TB screening (79.4%, n=62) with favourable attitudes (84.6%, n=66). More than one third of PPs (46%, n=36) do not suspect TB in patients presenting with cough more than 2 weeks. The salient practices of history taking, examinations such as checking socio economic status, checking previous antibiotics usage, exclusion of TB in pregnancy and diabetes, examining lymphadenopathies are missed by PPs during their routine work.

Conclusion

Overall knowledge and attitudes were satisfactory among PPs. Some salient points of history taking, examinations are missed by PPs during their routine. Referrals of patients with more than 2 weeks of cough to MCs are poor. PPs almost never use MC for sending sputum for AFB.

Index Terms- Knowledge, Attitudes, Practices, Private practitioners, Tuberculosis, Patient screening

I. BACKGROUND

Tuberculosis is considered to be one of the 10 leading causes of death worldwide. Approximately about one third of the world population is infected with Mycobacterium TB and having the risk of getting disease¹. A special project called "End TB Strategy" was initiated by the WHO for the period of 2016 – 2030 aiming at elimination of TB from Sri Lanka².

In Sri Lanka, there is a network of district level laboratories called District Chest Clinic Laboratories (DCCL) and Microscopic Centres (MC) at peripheral level are ultimately linked with the National Tuberculosis Reference Laboratory³. According to the District Tuberculosis and Chest Officer (DTCO) at Gampaha District, all the Pulmonary Tuberculosis (PTB) suspects come to the public sector are supposed to be referred to the nearest MC of which the primary responsibility is to examine of sputum for AFB. Patient with a single positive sample will be referred to the DCC for the confirmation of diagnosis and expert opinion. Chest X ray evidences and sputum culture results will be considered in confirmation of the diagnosis. After the diagnosis, DOTS treatment is started and notification will be done.

About 1-2% of the patients those who are presenting with respiratory symptoms are considered to be infected with TB⁴. Therefore NPTCCD emphasizes the importance of increasing the number of referrals to MCs in order to identify more and more cases, particularly at the early stages of the disease. However, there is a significant underutilization of MCs is evident, which may have undervalue the true TB picture in the country⁵. Further, poor contact tracing and inadequate detection of new cases have been identified as major weakness in TB control program in western province⁶. Even though annual estimate of new TB cases in Sri Lanka is about 17000, only about 11000 are being detected, keeping a 6000 gap. Nearly about 55% of the reported cases are having smear positive pulmonary TB making emphasis on early diagnosis and treatment⁷.

Tuberculosis should be suspected in patients those who are having cough for more than two weeks. Some of the symptoms like, loss of appetite, night sweats, loss of weight, haemoptysis, excessive tiredness, and shortness of breath can be associated⁸.

Screening for Pulmonary Tuberculosis in Sri Lankan setting: Screening can be done by doing chest X-rays and checking three sputum samples, which is the most reliable and cost effective, test³. According to consultant chest physician General hospital Kaluthara, first and third spot samples and second early morning sputum sample have to be checked. If two or three samples become positive for AFB, it is considered as having TB, whereas if only one sample becomes positive, it should be supported by chest X ray evidences of TB. In a case where all three sputum samples become negative for AFB with chest x ray with TB features and all the broad spectrum antibiotics are failing to improve the condition, diagnosis has to be made by Clinician. Some supportive tests like tuberculin test (Mantoux test) will be helpful in these conditions even though it is not a diagnostic test. Screening is recommended for pregnancy with poor weight gain, diabetes mellitus and severe malnutrition, close contact children below 5 years and close contacts of 5-15 years of age with pulmonary symptoms⁹.

In Sri Lanka, private sector provides services for about 50% of the total healthcare seekers¹⁰. The study results of Knowledge, attitudes, practices among private practitioners regarding Tuberculosis patient detection and treatment in Kaluthara district, may help the NPTCCD to conduct knowledge improving programs, remove barriers in screening process and further improve attitudes of PPs if they are real matters on the ground.

Methodology

This is a descriptive cross-sectional study carried out among PPs in different areas in Kaluthara district where the Microscopic Centres (MC) are available.

Assessment of Knowledge and Attitudes: The PPs were defined as “the allopathic PPs who were full time or part time engaged in diagnosis and treatment process more than 6 months duration at their own places or the places belong to private owners by charging money from the patients”. The PPs who were located at 5 Km radius from the MC and operated minimum of 5 days per week were selected for the study; Horana, Panadura, Kalutara, Beruwala, Ingiriya, Mathugama and Bulathsinhala. The total of 153 PPs was interviewed during 18.12.2018 to 18.12.2019.

Assessment of Practices: Ten PPs from the study population were selected proportionately to the number of PPs practicing in each area. The required number of PPs from an area was selected randomly.

Self-administered Questionnaire (SAQ) A: SAQ A consists of 42 items to assess some important demographic data, knowledge and attitudes of PPs’ regarding Tuberculosis patient detection and treatment process.

Self-Administered Questionnaire B: Practices and some important socio demographic factors were assessed. It included 8 open ended questions on 3 case scenarios related to tuberculosis diagnosis and management.

Quality of data: The two questionnaires including case scenarios (clinical vignettes) were developed by co-investigators with the expert guidance of Chest Physician and District Tuberculosis Control Officer using WHO guidelines^{11,12,13},

National TB manuals^{14,3,15,16,17}, questionnaires used in previous studies¹⁸ and literature¹⁹.

Ethical issues and clearance: Ethical clearance was obtained by Post Graduate institute of Medicine, University of Colombo.

Analysis of Knowledge: The Data were entered in to “statistical package for social sciences” (SPSS) Version 17 software. Knowledge of the PPs was calculated according to a predetermined marking scheme given for each question and the total cumulative mark score was calculated for each PP. Most of the questions were stem framed Weighted marks were given for each of the question according to expert opinion and gold standards available in the guidelines developed by NPTCCD^{2,3,9,14,15,17}. Each wrong answer, “Do Not Know” answer and missing values were given zero mark. The final mark obtained was expressed as a fraction of total cumulative knowledge score.

Criteria in setting up knowledge score limits

All the questions necessarily important for screening a PTB suspects were selected and their cumulative score percentage is 68%. Minimum to that score was categorized as “unsatisfactory” and above as “Satisfactory”.

Analysis of Attitudes: Some questions were negatively phrased in order to assure thoughtful responses and to avoid mechanical responses from readers. The six point likert scale was used and the PPs had to choose single response from Strongly agree, Agree, and Slightly agree, Slightly disagree, Disagree and Strongly disagree which gets 6-1 marks respectively. Negatively worded items were reversely valued for scoring purposes. An individual should at least slightly agree for positively phrased statements and slightly disagree for negatively phrased statements by his response. Based on agreed or non-agreed status of answers score was categorized as “Favourable Attitudes” and “Unfavourable Attitudes”

Analysis of Practices: Thematic analysis was done for which Grounded theory along with constant comparative methodology²⁰ was followed.

Thematic analysis: The meaning units which were in the data set that related to the study objective were identified and coded. Similar codes were grouped as themes and further to subthemes. Information extracted from the in depth interviews grouped into 04 themes. They were ranked on the frequencies of the repetition by each PPs.

Results

The results of the assessment of the knowledge and attitudes regarding Tuberculosis patient detection and treatment process among private practitioners are shown below.

Male and Female PPs were equally distributed (50%, n=39) and their mean age was 41.06 years (SD=11.5). Highest percent of PPs were in 40- 44 year age group (20.5%, n=16) and lowest percent were in 55-60 year group (6.4%, n=5). Majority were Sinhalese (97.4%, n=76) and Buddhist (96.2%, n=75). Highest responded area was Ingiriya (88%, n=7) and Panadura (68%, n=23) while lowest responded area was Kalutara (29%, n=13).

The majority of PPs belonged to other category (Grade-2, Preliminary grade and RMP) (61.5%, n=48) while the other category was grade-1 (38.4%, n=30). The experience of majority of the participants had less than 14 years (51.3%, n=40) and more than 14 years experienced category was 35.8% (n=28).

Majority of Participants had no post graduate qualifications (65.4%, n=51), no work experience in NPTCCD or CC (78.2%, n=61) and not trained in TB programs (66.7%, n=52) during their career.

Level of knowledge of PPs on TB screening

Majority of PPs have satisfactory level of knowledge on TB screening (79.4%, n=62) shown in Table 1. As described in Table 2, majority of PPs correctly answered to knowledge questions correctly. Nevertheless, only 44% of PPs (n=33) have correctly identified the higher risk of getting extra pulmonary TB below 5 year age group. Majority of PPs have identified duration of cough in diagnosing PTB (91%, n=71) and relationship between malnutrition and TB (92.3%, n=72) correctly. But knowledge on diabetes, TB relationship (79.5%, n=62) and pregnancy, TB relationship (70.5%, n=55) is at comparatively low. Majority of PPs knew CXR (90.1%, n=64) and sputum AFB (97.4%, n=76) as essential investigations for diagnosing PTB. Of the participants, majority knew the correct combinations of investigations in diagnosis of PTB (Two positive sputum samples (89.7%, n=70) or single positive sputum sample with CXR abnormalities (87.2%, n=68)) and majority knew that PTB diagnosis cannot be done only with CXR abnormalities (70.8%, n=51) and Mantoux test (83.3%, n=60).

Attitudes of PPs on different aspects of TB screening

Mean attitude score of the study population was 41.6 (SD±5.4). Majority of PPs have favourable attitudes towards screening of PTB (84.6%, n=66) as described in Table 1. In Question-3, only 53.8% (n=42) PPs have favourable attitudes to feel as PTB when a patient present with cough more than 2 weeks which is a main criteria of diagnosis. In Question-4, only 60.7% (n=47) has a favourable attitude in doing a CXR when a patient presents with cough more than 2 weeks (Table3).

Factors associated with attitudes on Screening for PTB

Unfavourable attitudes of PPs are significantly associated with experience over 14 years (P= 0.04), being a Grade 1 PPs (P= 0.007), other tested variable were not found significant associations (Table 4).

Practices of PPs on different aspects of TB screening

The thematic analysis of practices is shown in Table5. There were eight respondents in this section and their mean age was 38.4 years. Majority thought that evening low grade fever and contact history with TB patients are highly suggestive of TB and very few of them consider blood stained sputum also as a possibility. Almost all the PPs practiced the auscultation of lung bases for crepitation. They were not interested in looking for lymphadenopathy. None of them practiced percussion dullness at their settings **“Usually in this set up it is not practical to look for percussion dullness”**.

All of the PPs used to order CXR as the first line investigation if the history suggestive of. Most of them also interested in ordering full blood count. They also used to order ESR and C reactive protein as second line treatment. **Even though it is not necessary to do these, with FBC it is convenient to do it at the same time and provided some clue.”**

Regarding the management of such patients most of the PPs claimed that they used to refer them to a tertiary care unit. They were not interested in patient education due to the fact that it takes time. None of them were practiced referring the patients to Microscopic centres as they were unaware about these centres and their function **“Exact functions and the location of such places are not aware there for it is easy to refer the patients to tertiary care unit.”**

Discussion

The knowledge and the attitudes of the PPs were quantitatively analysed while practices were subjected to thematic analysis in this study. The overall response rate of the PPs was 51%.

Knowledge among PPs on screening for tuberculosis

Majority of PPs have overall satisfactory level of knowledge in different aspects of diagnosis, investigations and management. Majority knows essential TB diagnostic investigations and correct combinations in diagnosing PTB (Table 2). Similar studies conducted in San Diego Country USA²¹, India²², and Pakistan²³, have shown the fact that the knowledge fraction of medical officers usually high. But in this study the relationship between uncontrolled diabetes with cough, pregnancy with cough and poor weight gain, vulnerability of children less than 5 years age group for Extra Pulmonary Tuberculosis have been identified in relatively low intensity (Table 2).

Attitudes among PPs on screening for tuberculosis and Associations

The overall attitude on TB screening is favourable among PPs (Table 01). However considerable amount of PPs (46%, n=36) do not feel possibility of PTB when a patient present with cough more than 2 weeks which is a major indication for screening. According to Table 4, PPs who have less than 14 year experience (p=0.04) and belongs to preliminary or grade 2 categories (P=0.008) have significantly favourable attitudes. Supporting this evidence the study revealed that majority of PPs did not have post graduate qualifications (65.4%, n=51), experience in NPTCCD or CC (78.2%, n=61) or any training during their career on TB (66.7%, n=52). Professional knowledge and experience may enhance if PPs are exposed to higher education, training or continues professional development.

Practices among PPs on screening for tuberculosis

Most of the PPs had enough knowledge on the findings related to history to come to a correct diagnosis. Lower socio-economic status is associated with increased risk of TB²⁴ of which PPs were not much concerned about. According to the consultant chest physician at Kaluthara Hospital, Quinolones (Ciprofloxacin and Levofloxacin) can mask the symptoms of TB in a greater scale but PPs were interested in recent intake of antibiotics.

Opinion on examination practices most of the PPs practiced auscultation even though literature suggestive of painless cervical and supraclavicular lymphadenopathies, abnormal breath sounds especially over upper lobes, rales or bronchial breath signs indicating lung consolidation⁸. Reason behind this might be the convenient method for them. Three sputum samples and chest x-ray are cost effective for diagnosis of PTB which is usually used in insufficient resourced settings¹⁵. However almost all the PPs

were knew the importance of ordering the chest X-ray. At the same time they also interested in ordering FBC, ESR and C reactive protein.

Views regarding management of such patients, majority agreed to refer them to tertiary care unit although six functioning Microscopic centres available in Kaluthara district. Further, knowledge regarding microscopic centres were very poor almost zero. Patient education was not considered as an important fact in this assessment.

Limitations

The practices were measured through an self-administered questionnaire using open ended questions based on clinical vignettes and could not be measured by direct observations.

Conclusions and Recommendations

Overall knowledge and attitudes were satisfactory among PPs. The salient points of history taking, examinations such as checking socio economic status, checking previous antibiotics usage, exclusion of TB in pregnancy and diabetes, examining lymphadenopathies are missed by PPs during their routine and the requirement of screening contact children less than 5 years. Referrals of patients with more than 2 weeks of cough to MCs are poor. PPs almost never use MC for sending sputum for AFB. However, the attitudes of PPs are suggested to be enhanced with continuous professional education and training. Implementation of Tuberculosis Suspect Register (TBSR) at PP setting and private hospitals mediating through Private Health Regulatory Council (PHRC), periodic review meetings with PPs at RDHS levels, compulsory In-service training programs for PPs are among the recommendations.

Conflicts of Interests

The authors declare that they have no conflicts of interests.

Acknowledgments

The authors acknowledge all the research assistants worked with and the PPs in Kaluthara District Sri Lanka.

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Attitudes of Breastfeeding Mothers Towards Ten Steps of Successful Breastfeeding in Kapsabet County Referral Hospital, Kenya

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DOI: 10.29322/IJSRP.10.09.2020.p10543

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10543>

ABSTRACT

Breastfeeding leads to both short and long-term benefits of a child. It helps reduce infections and mortality among infants, improves mental and motor development, and protects against obesity and metabolic diseases later in the life course. The ten steps are maternity proven practices which help in achieving exclusive breastfeeding which remains a challenge. The aim of this paper was to assess the attitudes of breastfeeding mothers towards ten steps of successful breastfeeding in Kapsabet County Referral Hospital, Kenya. The core methodological approach involved cross sectional research design through incorporation of both quantitative and qualitative approaches among 184 randomly selected mothers with infants less than 6 months old. Data was collected using researcher-administered questionnaires and a focus group discussion guide. Six focus group discussions were held at the end of the study with both caregivers and mother practicing and those not practicing exclusive breast feeding. Data analysis was done using statistical package for social sciences (SPSS) software version 22. The results of the study showed that 80% of the study participants had a positive attitude towards the ten steps of breast feeding despite the fact that they did not practice exclusive breastfeeding. The study recommended that mothers need to be trained on the importance of following the ten steps of breastfeeding as per the recommendations of World Health organization.

Key Words: Attitude, Ten steps, Breastfeeding, Mothers

1.0 Introduction

Breastfeeding is encouraged as the best method of child feeding and one of the most cost-effective means to arouse healthy child growth and development (WHO, 2013). Furthermore, breastfeeding benefits mothers, through postpartum weight loss, reduction in breast and ovarian cancer, and enhanced mother–infant attachment (WHO, 2012). Since 2001, the World Health Organization (WHO) has recommended exclusive breastfeeding for the first 6 months of life (Kramer & Kakuma, 2012). Despite advantages, the percentage of countries that meet these recommendations remains low (Alzaheb, 2017). One of the global targets endorsed by the WHO's member states is to increase the rate of exclusive breastfeeding in the first 6 months up to at least 50% (WHO, 2014).

The Millennium Development Goals which Kenya is a signatory strives to reduce child mortality is in tandem with government policies to promote the child and maternal health. The call to support breastfeeding by the World Health Organization and the New Joint Commission for Hospital Assessment Perinatal Care Core Measure on exclusive breastfeeding underscores the urgency to increase exclusive breastfeeding rates (Joint Commission, 2010; U. S. Department of Health and Human Service, 2011; WHO, 2012). Around 2008, the number of children who were ever breastfed varied widely across the OECD countries, ranging from less than 70% in Ireland and France, up to almost 100% in Denmark, Sweden and Norway (OECD Database, 2013). African countries demonstrate similar results with countries such as Ghana and Botswana scoring 99% for breastfeeding initiation at birth and up to nearly 12% at 3-4 months in Malawi, Namibia, Mauritius and Niger (OECD Database, 2013).

Ten steps to successful breastfeeding has been pointed out as one of the most effective preventive health measures to globally reduce child mortality and morbidity (Bartick & Reinhold, 2010). However, there are a number of inequalities in breastfeeding

outcomes by socio-economic indicators and by race and ethnicity (WHO, 2012). Low wealth populations in developed and developing nations, as a group, exhibits lower breastfeeding rates, and thus are vulnerable to higher incidences of breastfeeding preventable illnesses.

Kenyan lactating mothers breastfeeding practices extensively differ with the recommended practices. For instance, according to Kenyan Demographic Health Survey, only 32% of the under 6 months children are breastfed yearly, albeit the fact that 97% of Kenyan children are breastfed at some point (African Population and Health Research, 2010). United Nations (2010) found out that, in order to meet the Millennium Development Goals of halving the prevalence of underweight children by 2015, mothers must comply with the recommended breastfeeding practices. Therefore, the Kenyan government has been promoting the Ten Steps to successful breastfeeding in different regions in Kenya.

Studies suggest that attitudes toward breastfeeding begin well before pregnancy and decisions concerning breastfeeding are often made early in life (Saunders-Goldson & Edwards, 2004), therefore, research examining attitudes before pregnancy is important. Identifying predictors of breastfeeding intentions facilitate the design of effective breastfeeding promotion interventions. Several studies in Western countries have been assessed the attitudes of young populations toward breastfeeding Zahid *et al.*, 2016). Attitudes regarding breastfeeding among university students vary across countries. A study of university students in Lebanon and Syria showed positive attitudes among participants, and breastfeeding intention was significantly associated with knowledge and attitude (Hamade *et al.*, 2014). In another study in Jordan, university students showed a positive level of breastfeeding knowledge, but their attitudes toward breastfeeding practices were negative (Al-Domi, 2015). Therefore, the current paper investigated attitudes of breastfeeding mothers towards ten steps of successful breastfeeding in Kapsabet County Referral Hospital, Kenya.

2.0 Literature Review

Attending an urban clinic was found to be the strongest predictor of knowledge on ten steps to successful breastfeeding by mothers as they claim that care staff in metropolitan clinics are well educated hence have knowledge to impart on mothers (de Paoli, 2001). Moreover, de Paoli *et al.* assert that the work of health staff in urban setting is better supervised and staffs are exposed to more training opportunities than their rural counterparts hence impart proper knowledge to their client (de Paoli, 2001; Cherop *et al.*, 2009). Furthermore, health workers are responsible for health education including infant feeding practices and counseling in pre and postnatal period in health facilities hence imparting knowledge to mothers on infant feeding practices (Aidam *et al.*, 2005).

Self-efficacy is based on people's assessment regarding whether they have the knowledge and skill to make changes in their behavior and whether their situation allows them change (Naidoo, 2000). In 1999, Dennis developed the Breastfeeding Self-Efficacy Scale (BSES), containing 32 items to measure mothers' viewpoint of self-efficacy (WHO, 2003). The scale was further developed in 2003 and the latest version has just 14 items (Naidoo, 2000). Their study indicated that maternal self-efficacy was significantly associated with duration of breastfeeding, after adjusting for marital status, maternal education and income. However, this scale only targets on pregnant women or new mothers and cannot be extended to other people such as the mother's social network, although this may also influence mothers' feeding choices.

3.0 Methodology

The study used a cross sectional survey which employed both qualitative and quantitative methods in data collection as per the recommendations of Katzenellenbogen *et al.*, (2002). In this type of study design, either the entire population or a subset thereof is selected, and from these individuals, data are collected to help answer research questions of interest. It is called cross-sectional because the information which is gathered represents what is going on at only one point in time The study aimed at collecting

information from respondents on care givers knowledge on the Ten Steps to successful breastfeeding, the attitude of the lactating mothers on the Ten Steps to successful breastfeeding and the practices of the care givers on the Ten Steps to successful breastfeeding. Additionally, the knowledge of the MCH clinic nurse on the Ten Steps to successful breastfeeding was also explored.

The study targeted mothers with their infants 0<6 months old residing within Nandi county by accessing post-natal care at Kapsabet county hospital. A target population of 195 mothers was used but only 184 mothers responded during the study. All breastfeeding mothers visiting the MCH clinic at Kapsabet County Referral Hospital were invited to participate in filling the questionnaires. Systematic sampling was used to select the subjects since it provides equal chance of inclusion, minimizes bias and has great potential to provide good representation.

The sample size was calculated using a formula by Cochran (Israel, 1992); This was adopted because the study only assumes the finite nature of the population and to be more confident that the study meets the required sample size based on the formulation, the acceptable sample size ranged between a minimum ratio of parameter to 10 observations.

$$n = \frac{z^2 p(100-p)}{\varepsilon^2} \text{ where}$$

n = the required minimum sample size

p= estimated prevalence of mothers who breastfeed exclusively up to 6 months of infants age (which is 13% as per study by KNBS and ICF Macro, 2010))

ε = margin of error on p (set at 5)

q = 1-p

z= standard normal deviate corresponding to 95% confidence level (=1.96)

By substituting the above equation, it gave 192 respondents

A questionnaire with both closed and open-ended questions was used to collect both the quantitative and qualitative information on breastfeeding mothers' knowledge on ten steps to successful breastfeeding. The questionnaire was adopted from a face-validated one used in a study in a low-resource urban setting by Ochola (2008) and modified for this study. In addition, a focus group discussion (FGD) guide was used to elicit information on infant feeding practices from the breastfeeding mothers. In order to pre-test the questionnaire on the length, content, question wording, and language, eight respondents (5% of the total sample) from Nandi attending PNC were interviewed. This was necessary to facilitate modifications on the questionnaire by correcting mistakes. This also ensured that the researchers conducted the interviews in a standardized way.

Additionally, questionnaires were revised by team leaders and the recommended modifications to specific items were done to suit the study objectives. Ensuring that the questionnaire content represented the study objectives enhanced content validity. Questionnaires were also pretested in Moi Teaching and Referral Hospital before actual data collection begun. Finally, during data collection the questions were paraphrased and repeated severally so as to ascertain whether the respondents had comprehended the questions.

The collected data was checked, coded, cleaned and entered into SPSS software for analysis. All the analysis of quantitative data was done using the Statistical Package for Social Sciences (SPSS) version 22. Frequencies and percentages were used. Data from focus group discussions was transcribed, responses arranged in general categories identified in the discussion guide then coded.

Common themes were identified, inferences made from each theme and conclusion drawn then triangulated with the data from the questionnaire.

Clearance to obtain a research permit for the study was sought from Kisi university graduate school. Research permit was also obtained from National Council for Science, Technology and Innovations and the Management of Kapsabet County referral Hospital to conduct the study. Informed consent was obtained from the mothers before conducting the research. The information obtained from the study participants was handled with utmost confidentiality.

4.0 Results

Focus group discussions were organized for mothers practicing the ten steps to successful breastfeeding and to those not practicing as well as to other caregivers like grandmothers, fathers and older siblings. Information from the FGDs was analyzed for common themes emerging from the discussion. Discussions were guided by a set of questions in the FGD guide. The FGD showed that most of the mothers indicated that they got information regarding breastfeeding from the health facility they attended both before and after delivery. Some got information from their own mothers or mother in-laws, relatives, friends, media and TBAs. The mothers reported that they had received various messages regarding breastfeeding. Some of the messages they received included the message that *'one should breastfeed on one breast until it is emptied then change to the other'* as said by one mother while another said, *'I was told to clean the breasts before breastfeeding.'* Other messages that the mothers received included the message that a mother should breastfeed within thirty minutes time after delivery; breastfeed frequently as long as the child demands; breastfeeding helps the child to grow strong; breastfeed exclusively for six months; and when the child hiccups give breast milk instead of water.

The mothers reported that they concurred with messages given regarding breastfeeding counseling. Some mothers reported that they were already realizing some of the benefits of exclusive breastfeeding but with challenges one mother claimed that her baby cries a lot and this might force her to change to other forms of feeding.

Mothers in this group seemed to have a good understanding of the concept often steps of breastfeeding and stated that it meant giving the baby only breast milk without even water for six months. Some mothers reported that they had practiced exclusive breastfeeding with their older children.

The mothers gave the benefits of breastfeeding from their own understanding and also from what they had learnt from the hospital as follows: *'Mother's milk is more important to the baby than any other food as it contains all the nutrients that a baby needs for six months.'* as said by one mother. Other benefits that the mothers gave were; breastfeeding helps the baby not to contract many diseases; breast milk is safer and hygienic and is always available; breastfeeding helps a mother not to get pregnant although not always; and that breast milk makes the baby to grow healthy and strong.

According to the results of the study, 80% of the women interviewed had a positive attitude towards the ten steps of breastfeeding. The remaining 13% of the women had a neutral attitude and the remaining 7% had a negative attitude towards the ten steps of breastfeeding as shown in Table 1.

Table 1: Breastfeeding mothers' attitude towards the ten steps of breastfeeding

Attitude	Frequency	Percentages
Positive	123	80

Neutral	42	13
Negative	17	7

Table 1 shows that majority of the breastfeeding mothers at Kapsabet County Referral Hospital had a positive attitude towards the ten steps of breast feeding. This implies that the respondents were in a position to follow the ten steps of breastfeeding which was in line with WHO (2013) recommendations. This further points out that mothers had intention of breastfeeding their infants however, majority did not breast feed their infants exclusively. This study findings are similar to those of Mohamed, Ochola, and Owino (2020) who found in their study that women in Wajir county had a positive attitude towards exclusive breastfeeding despite the fact that they did not breastfed their infants exclusively.

5.0 Conclusions

The study participants had a positive attitude towards the ten steps of breast feeding despite the fact that most of them did not follow the ten steps. The study therefore recommends that mothers need to be trained on the importance of following the ten steps of breastfeeding as per the recommendations of WHO (2013).

6.0 Ethical considerations

The study was approved by the National commission for Science Technology and Innovations (NACOSTI). Written and informed consent for participation was obtained from each participant. They were also ensured about the confidentiality of their information and the voluntariness of participation in the study.

Competing interest: None

7.0 References

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Pictorial Consent in Cardiac Surgery: A far better option rather than Standard Informed Written Consent

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DOI: 10.29322/IJSRP.10.09.2020.p10544
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10544>

Abstract- Because of the complexity of the procedures, high level of clarification for the patients as well as their attendants while taking consent is a must as cardiac surgery is associated with significant morbidity and mortality. Pictorial consent with pre-operative education is a far better option in this regard. We randomly took a total of 150 patients within the age group of 18 to 70 years, and they were explained with standard consent followed by pictorial consent and vice versa by the same informant. And they were given a preset questionnaire format after both consents. Later, based on their answers, comparison in relation to the level of clarity was done. Questionnaire was formatted after rigorous modification from the reviews of literature.

Key words: Consent, Informed, Pictorial, Cardiac, Legal

I. INTRODUCTION

A New York Court gave a verdict in 1914 that every human has a right to know what shall be done with his body & without proper consent he will be liable for damages(1). The concept of "consent" was first given by Salgo V. in 1957 as one of the most important aspects of legal, ethical and fundamental documentation in the context of medical practice(2). Proper communication, justified explanation of benefit-risk & possible alternative options of the planned procedure are actually neglected while focusing just on taking signature on written standard consent(3). In the current era, the process of consent is not adequate(4,5,6). Other interactive tools such as freehand diagrams, leaflet, booklet, audiovisual tapes, computer programs

and interactive power-point presentations are much more effective than the conventional standard consent (7,8). Numerous studies, planning, work-up, follow-up have been made for improving the consent process, as the regular update in the consent process is mandatory in the present day of global digitalization. Several guidelines and recommendations have come but with a similar basis (9,10). The process of taking consent is truly based upon the strong Doctor-patient relationship. Just signing on a consent paper does not signify that patient has fully understood the fact (11).

II. MATERIALS & METHODS

We randomly took a total of 150 patients within the age group of 18 to 70 years, and they were explained with standard consent followed by pictorial consent and vice versa by the same informant. And they were given a preset questionnaire format after both consents. Later, based on their answers, comparison in relation to the level of clarity was done. Questionnaire was formatted after rigorous modification from the review of literatures.

III. RESULTS

After the explanation of both consents, a questionnaire (table 1) was given and the result is depicted in table 2. Age group of the study population was 18-70 years. Level of literacy was defined as per Gov Of India.

Table 3 shows the time taken for explaining the two consent. Enrolled patients are summarized in table 4. The result is noticeably clear as we can see here; and the level of clarity was much better after the pictorial consent.

TABLE 1.

Serial No	Knowledge	Standard Consent/Pictorial Consent
1.	Diagnosis of the disease	Yes/No
2.	Operative procedure planned	Yes/No
3.	Alternative options	Yes/No
4.	Approaches/incisions	Yes/No
5.	Monitoring lines/devices	Yes/No
6.	Pacing wires/temporary pacemaker	Yes/No
7.	Drains	Yes/No
8.	Comorbidities increasing the risk	Yes/No
9.	Blood products & complications	Yes/No
10.	Cardioversion	Yes/No
11.	ICU stay	Yes/No
12.	Post-operative events	Yes/No
13.	Long-term outcomes-survival/morbidity/mortality	Yes/No

TABLE 2.

SERIAL NO.	KNOWLEDGE	STANDARD CONSENT	PICTORIAL CONSENT
1.	Diagnosis of the disease	80	145
2.	Operative procedure planned	51	142
3.	Alternative options	71	138
4.	Approaches/incisions	91	148
5.	Monitoring lines/devices	48	132
6.	Pacing wires/temporary pacemaker	61	129
7.	Drains	101	141
8.	Comorbidities increasing the risk	78	123
9.	Blood products & complications	78	141
10.	Cardioversion	41	129
11.	ICU stay	96	131
12.	Post-operative events	79	137
13.	Long-term outcomes-survival/morbidity/mortality	68	128

TABLE 3.

TIME TAKEN (minutes)	STANDARD CONSENT	PICTORIAL CONSENT
Maximum	12	29
Minimum	7	13
Average	10	21

TABLE 4.

PATIENTS	MALE	FEMALE
AGE GROUPS 18 - 35	26	38
36 - 55	32	23
56 - 70	21	10
LITERATE	45	15
ILLITERATE	34	56

IV. DISCUSSION

In clinical ground “informed consent” is the legal and ethical conceptual process by which the patient is provided with information relevant to a proposed diagnostic or therapeutic intervention; and should be elaborated sufficiently that the patient can come to a decision for making a rational choice among the possible available options. In actual clinical scenario the informed consent has just become a process of taking signature on consent form due to huge and increasing work load in the hospital(12).Because of global digital advancements, the patients are now much aware ,and they come to clinic or hospital with different queries regarding different therapeutic options, after exploring their problems in the internet; as a result the process of consent has been complex(13,14,15).

That is why the decision making must be customized according to the patient’s ability to understand (16). It should involve active contribution of both the doctor and the patient but choice making must be done voluntarily without any external influence to avoid legal conflicts(17,18).Another important issue while taking standard written consent is language barrier when both the informant and the patient are from two different geographical areas; in that situation self-explanatory pictorial consent is a better option(19,20).

While explaining the pictorial consent, the facts were more easily clarified and understood such as:

- 1.Diagnosis: Perception level was far better after simple illustrations while disclosing the diagnosis.
- 2.Proposed treatment plan and possible alternative: Patient was satisfied after being explained in pictorial form, power-point presentation including audiovisual clips.
- 3.Approaches/incisions: Confusion of leg wounds in post-operative CABG patients were cleared when they were explained with free-hand diagrams prior to surgery.
- 4.Monitoring devices/pacing wire/drains: The necessity of neck lines, invasive(arterial) blood pressure monitoring, infusion pumps with inotropes or supporting medications, basics of all parameters projected on the monitors were explained in a simplified manner with the help of illustrations. It was also explained that the pacing wire that come out from the body is for temporary pacing to treat the transient heart blocks, and it will be cut before discharge. The functions of both mediastinal and chest drains were explained along with the probable time of its removal.
- 6.Cardiopulmonary bypass: It was better understood in pictorial form.

7.Cardioversion and its possible complications were explained.

8.Blood product transfusion and its complications: They had a few queries regarding their preoperative donated blood, and it may give better recovery if transfused, but they were explained about the complications of unnecessary transfusions.

9.Diet: Dietary modification is an important aspect in post-operative CABG patients; and food stuffs were better understood in pictorial form for the illiterate.

People must understand that there is no procedure that is risk-free (12). Although the level of clarity is far improved for the patients after being explained the pictorial consent.

V. LIMITATIONS

The pictorial consent we tried to utilize had its own limitations. The questionnaire format, that was used to assess the level of clarity, did not cover so many significant aspects of the surgical plans.

VI. CONCLUSIONS

As patient can understand and remember a very few information provided during informed consent, the standard consent in cardiac surgery should be improved with the implementation of interactive and self-explanatory measures such as simple pictures, diagrams, illustrations, audiovisual tapes. It is not assured that the patient will go through the facts in the written consent completely even it may contain the detailed information, while the pictorial consent being interactive in nature involves the patient for active participation for achieving possible highest level of clarity in understanding. A good consent process would help better in avoiding ethical and legal conflicts. More studies should be carried out to improve and standardize the concept of pictorial consent as it is a newer advancement in the field of medical practice.

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Leveraging Big Data and IoT technology into Smart Homes

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DOI: 10.29322/IJSRP.10.09.2020.p10545
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10545>

Abstract- The energy sector generates huge amounts of data that can be used by utility providers in energy conservation. As data is increasing drastically, the conventional energy meter is not sufficient to keep track of this data that incorporates demand and supply patterns of energy. The conventional energy meter manually retrieved information from a residential customer or an industrial customer and manually billed the consumption. This process was tedious, time consuming and costly for the utility providers. Subsequently, this led to the adoption of smart grid systems for energy management and efficient data processing. Another important facet of this research is the incorporation of residential sector, which is the highest consumer of energy and generates humongous amounts of data. Hence, to understand the data transmission process in a residential sector, it is necessary to understand the data transmission process in one household automation system that consists of a smart meter system and does not contain the conventional energy meter. The large volume of data, popularly known as energy big data, generated from smart meters holds valuable insights that can be utilized by the utility companies and home owners to make strategic control decisions in terms of power generation, consumption, and monitoring. In this research paper, a smart home lifecycle is demonstrated with a clear description regarding the progression of storing, processing, analyzing and forming of visualized data from smart homes. This can be used by consumers and utility providers to gain insights and track consumption patterns of a single smart home unit. This paper will thus provide a summarized synopsis to those who want to gain information regarding available techniques and methodology for smart system automation process for any sector such as healthcare, education, information technology, oil and gas etc.

Index Terms- Energy Management, Hadoop, Internet of Things, OLAP, Smart Homes

I. INTRODUCTION

Massive amount of data is generated every day by business sectors, residential sectors, industrial sectors, transportation facilities, telecommunication domains etc. Today, data is increasing exponentially and reaching levels of Terabytes (10^{12}), Petabytes (10^{15}), Exabytes (10^{18}), Zettabytes (10^{21}) etc. When compared to traditional business data, human data is increasing at an overall 10x faster growth rate, whereas machine data is increasing at a 50x growth rate [16]. This massive amount of data that involves structured and unstructured forms of data is known as big data, and is creating new opportunities for businesses to

grow into a customer oriented and information driven environment. Hence, this enormous amount of data can be stored, analyzed, processed and developed into meaningful insights that can help utility providers to formulate ways to improve energy consumption, generation, operation and management. Since the cost of fossil fuels are increasing, carbon emissions are increasing, environment impacts are increasing, non renewable resources are depleting, equipment are leading towards obsolescence, security levels of energy resources are increasing and data generated by energy sectors are substantial, it is necessary for utility providers to store, analyze, process and develop meaningful results through new technological advancements while replacing traditional systems. Meaningful results from the data processed can be formulated into visualizations such as graphs and reports which can be used by utility providers, consumers and other stakeholders such as government, businesses etc.

Residential and commercial sectors are responsible for the highest consumption of energy in any economy. The big data generated by the residential sector, especially the smart homes, periodically can be leveraged into insightful results that can aid in predicting customer demands, observing customer consumption patterns and providing a complete load profile analysis of energy consumption. A smart home concept incorporates energy consumption units that are transferred to intelligent network nodes where energy is locally produced and intelligently managed [14]. On the other hand, like a smart grid lifecycle involves data generation, data acquisition, data storing, data processing, data querying and analytics and monitoring of the data, the same is true with respect to a smart home facility. Moreover, the smart home concept follows “ubiquitous sensing” which means that network of sensors are integrated to a network of processing devices which eventually structure and build multivariate information [15]. Hence, this paper describes this ubiquitous sensing concept by demonstrating the four data transmission stages in smart homes; collection, storage, processing, and analysis and visualization.

II. BRIEF OVERVIEW ON SMART HOMES

A smart grid is an advanced version of an electric grid where grid performance is utilized in satisfying the demand and supply of users efficiently through information and communication technologies (ICTs) and material engineering that focuses on maintenance of a sustainable system [18]. This has become a fundamental research domain for the energy sector to optimize

energy consumption. Smart Homes and Smart meters are the two elements of the smart grid application of Internet of Things [14]. Smart homes are based on the concept of Internet of things, which is a primary source of sensory data [4] whereas smart meter is an interface unit between the smart grid of utility provider and the end user in a smart home [14].

In Smart Homes, air conditioning, lighting, heating and other systems are activated only when a consumer needs to use a particular system. This leads to optimization of energy consumption. The big data provided by smart homes detects patterns, nuances and anomalies, which could not be found otherwise. Consequently, this helps utility providers to analyze the consumption pattern and behavior of clients and convert this streaming data to visualized reports. Accordingly, providers can use these reports to monitor and ensure the anticipated changes in supply and demand with regard to client's electricity consumption behavior. This shows that data from smart homes helps utility providers in forecasting energy consumption, satisfying energy demand, improving the smart grid performance and lowering energy cost by supplying energy when needed.

III. DATA SOURCES IN SMART HOMES

The physical architecture of a smart home or any smart system integrates or bridges the gap between the physical world and computer-based systems. The physical architecture of a smart home involves wireless sensors, actuators, microcontrollers, processors, control center etc. [3][11]. The purpose of these devices is to communicate with each other in a network and provide meaningful insights. The technology used in an IoT system is driven by new innovations and has solved problems with regard to accuracy, cost and the ability to detect things that couldn't be detected previously. Consequently, IoT systems incorporate wireless sensors and actuators in its physical architecture where sensors convert a physical energy to an electrical impulse whereas, on the other hand, actuators convert an electrical input to a physical action [11]. Hence, sensors are devices that react to a stimulus and send a command to the control center, which activates an actuator to manipulate the physical environment. For example, a temperature sensor detects heat from a flame, which is the stimulus in this case, and sends a command to the control center. The control center sends the command to a sprinkler actuator, which eventually turns on and puts out the flame.

Sensors track and supervise the dweller of a house. There are different types of sensors used in a smart home system such as motion sensors, water sensors, doorbell sensors, temperature sensors, light sensors, weather sensors, synthetic sensors etc. [13], and there are different types of actuators as well in a smart system such as electric motors, hydraulic systems etc. These sensors and actuators are connected by wireless connections, mobile applications, wireless sensor networks and mobile sensor networks [3] [4]. WSNs are used to transmit data among sensor nodes through large geographic areas to increase communication capabilities regarding issues such as environmental research, water quality monitoring, civil engineering and wildlife habit monitoring [4]. Therefore, through the network structure, these technologies and the process of "Sensor to Actuator Flow"

generate tremendous data, which is processed and analyzed in later stages to drive decision-making. The data collected is processed for immediate decision making with regard to threat detection, immediate crash statistics, abrupt shutdowns, etc. [11]. The data that is collected from these devices are entry and exit times, level and hours of usage, temperature levels etc., which is then sent to a database storage system for further processing [7].

IV. DATA STORAGE

There are two types of databases for storage. This includes databases that follow the structured query language systems which are considered as traditional RDMS systems such as Oracle databases and open source systems that follow no SQL systems. There are various reasons why the development of big data has challenged the relational database management systems (RDMS) and has replaced these traditional systems with open source systems such as Hadoop and OLAP. RDMS are legacy systems that are not compatible with other technologies and are not set up to be simultaneously accessed for reporting and analysis. It analyzes structured data where it stores and analyzes data that are queried using a conventional SQL language. RDMS inculcates traditional form of row and column-oriented database and inundates parallel processing which is present in Hadoop and OLAP. The storage capacity is also limited when compared to the storage systems of Hadoop. RDMS includes the SQL query language where schemas are defined but, on the other hand, Hadoop follows a NOSQL query language where schemas are not required. RDMS does not possess the capability of processing data in real time like Hadoop due to lack of query performance and low latency caused by data storage issues. Subsequently, smart grid technology precisely smart homes, generate petabytes of data that create issues with respect to storage, processing and analyzing and this cannot be performed by traditional RDMS. Hadoop is thus good at indexing rich data, as it is flexible, scalable and cost effective. Therefore, a smart home setting should incorporate big tools like Hadoop and OLAP in analyzing the data achieved by these settings which can be used by consumers and utility providers to gain insights and facilitate demand and supply based on consumption needs. Therefore, through a Hadoop and OLAP system, the smart grid concept, which incorporates smart meter and smart homes, becomes more efficient as large data can be processed with faster data access as compared to traditional RDMS.

Hadoop incorporates a storage facility known as Hadoop Distributed File System (HDFS) that satisfies the issues regarding scalability, reliability, and fault tolerance. Through the data from advanced metering infrastructure (AMI) installed in smart grids and sensors, large bulk of data files are formed into blocks and stored in allocated HDFS cluster nodes which are termed as data nodes [5]. These data blocks are replicated into multiple data nodes where these data nodes are derived from name nodes, which store information regarding files and blocks [5]. These data blocks are further moved for processing to the Map Reduce processing stage in Hadoop. This multi-node structure of HDFS makes its fault tolerant [2].

V. DATA PROCESSING

Hadoop MapReduce, a programming model, is known for efficient and cost-effective processing of big data due to its batch processing capability. Each data stored in the HDFS cluster is sent into the mapper function where the Map Reduce algorithm is applied [5]. In the MapReduce processing layer, data is split into small parts, which is then formed into tasks. The process of this layer is reflected in the name of this layer “MapReduce”. Map refers to the stage where tasks are mapped according to the query in terms of key and value pair. The Map task transfers the pairs to the reduce stage where these key and value pairs are reduced, sorted and made into a new set of output [10]. The master node chooses the tasks and allocates to the required job tracker [8].

Along with MapReduce, there are other data processing frameworks that support Map Reduce. One of such Hadoop release is YARN (Yet Another Resource Negotiator), which solves issues regarding scalability and resource utilization. To eliminate these issues, YARN divides the Job Tracker into two components; Resource manager, which manages resources in the form of containers available across nodes, and Application manager, which manages and supervises the tasks of the resource manager and the individual nodes [6]. Hive is another tool of MapReduce, which is used for data querying. This particular tool is devised to execute SQL queries to process data through Map Reduce algorithm [6]. Hence, Hive is eventually connecting HDFS or Hadoop data warehouse with MapReduce framework.

OLAP is another tool that can be integrated with Hadoop and can be used for processing of data. It acquires data from a data warehouse, such as HDFS and HBase, in a multi-dimension form. This benefit present in Online Analytic Processing (OLAP) is not modeled in the relational database, Online Transactional Processing (OLTP) as OLTP is a two-dimensional data structure, which includes rows and columns. OLAP data warehouse stores aggregated data, which can be filtered, sliced and sorted into multidimensional schemas in the form of a cube. The data stored in for OLAP processing is used for future decision-making and analytical processing.

Depending on the needs and requirements of the consumer and utility provider, data can be processed in the form of measures and dimensions such as time, location and appliances etc., as shown in figure 1. These dimensions are further divided into hierarchies, levels and attributes for further aggregation [17]. Utility providers can use the levels to determine the consumption trends based on the appliances for each quarter in a particular location. Consequently, with regard to smart home automation, utility providers can use OLAP processing model for consumption analysis, demand patterns, demand forecast and trend analysis to provide real time information feedback to consumers. Utility providers can adjust the demand and supply of energy by analyzing the low power consumption of users of smart homes or redistribute the demand and supply of energy by analyzing the high-power consumption of users.

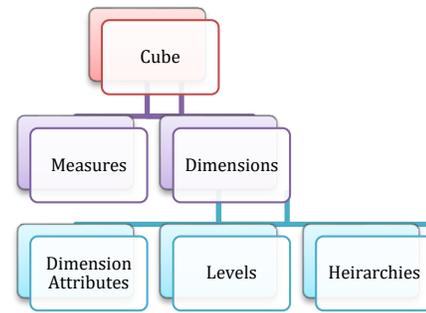


Figure 1: Data Process in OLAP

Complex data structures can be built by creating schemas or data points also known as dimensions, according to the OLAP system. Each dimension is then categorized into different attributes of a dimension. This is therefore shown in figure 2, where data obtained from smart homes can be formed into different types of appliances based on each quarter of the year in each city.

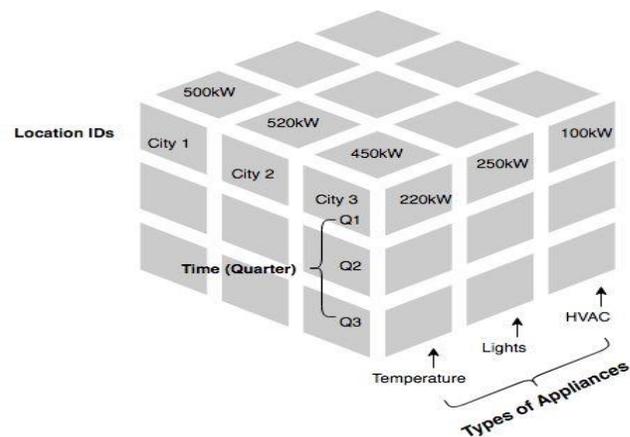


Figure 2: Multidimensional view of data in OLAP

This cube can further become more informative by further magnifying the data points as shown in figure 3:

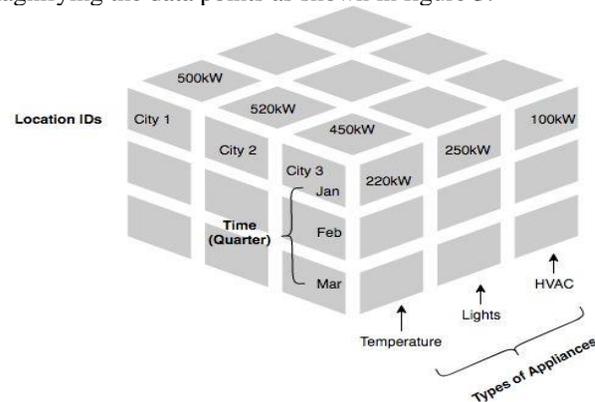


Figure 3: Multidimensional view of data concerning quarter 1

VI. DATA ANALYTICS (VISUALIZATION)

Map Reduce processing incorporates further analytical processing which is performed with the inculcation of other tools

of Hadoop. Through analytic algorithms such as artificial intelligence, machine learning and other algorithms such as PIG of Hadoop, utility providers will be able to provide energy efficiently and will be able to make intelligent decisions on energy management. These predictive analyses incorporate neural networks and genetic algorithms that help in forecasting and generating predictive models that give insight on consumption behavior. An example of a scientific development that incorporates neural networks and genetic algorithms is the building of artificial intelligence. Artificial intelligence in Pig, with the help of machine learning, analyses the “reasoning, behavior, rationality and thought process” [15] of a human being. Neural networks of artificial intelligence and support vector machines are known for flexible monitoring of smart houses [15], and play a vital role in predicting the energy requirements and analyzing the heating, ventilation and air-conditioning (HVAC) units of a smart home facility [3]. Moreover, an empirical research on energy consumption demonstrated that, through predictive analysis and optimization methods, there was 23% of energy savings as compared to energy consumption in the previous month in a smart facility [3].

OLAP is also involved in further analytical processing of data through tools such as Pentaho Business Intelligence. Data stored in Hadoop can be integrated with Pentaho business intelligence OLAP tool as Pentaho has the capability to integrate data, mold data into multidimensional form, report, mine and analyze data, and create a dashboard that showcase Pentaho reports and architectural data after ETL operations [12]. Due to the data integration capability of Pentaho, data is retrieved from the HDFS layer of Hadoop and transported to the Pentaho Stack [9], which is then transformed to a multidimensional model for OLAP operations as described above in figure 2 and 3. These multidimensional models in the form of a cube are then transformed to graphs and reports that can be used by utility providers and other stakeholders for further forecasting and energy management.

VII. CONCLUSION AND RECOMMENDATIONS

In conclusion, after analyzing different studies and frameworks, it is noticed that a theoretical big data solution involves the data sources stage followed by a data transformation stage which involves converting raw data to tables, schemas and clusters during the storage process. This data is transformed using big data platform and tools, which analyze and process this data into the end product through application and analytics. This process is explained in figure 4 and can be considered as the theoretical framework of big data solution.

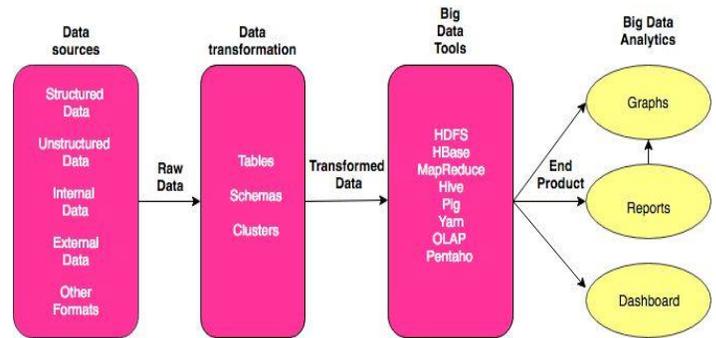


Figure 4: Theoretical framework of Big Data

Keeping in mind the theoretical framework of big data solution and various secondary researches, it can be seen that data transmission process from a residential unit to a utility sector involves four stages. These four stages are essential for an energy management progression. A utility provider needs to keep in mind the four stages facilitated in a smart home to track the demand and supply of energy consumption. Different stakeholders such as the home owner, the community owner, the state owner, the country owner [1] and the utility provider are affected by this humongous data transmission procedure that incorporates four stages; data generation, data storage, data processing, and data analytics. This procedure is briefly mapped in figure 5:

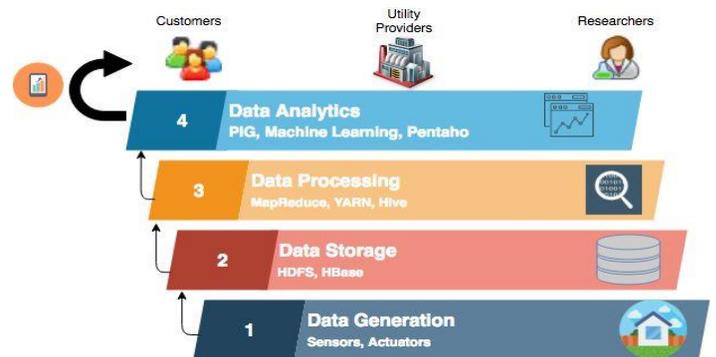


Figure 5: Four stages of data transmission from a smart home facility

Lastly, the world is going towards a technological change where various countries are focusing on energy management and are including smart cities and smart homes in their construction and infrastructural plans. Consequently, it is necessary for such countries that are adopting the concept of smart homes to keep in mind the stages of data transmission from a smart home facility and how this data can be used for forecasting demand and supply of energy, energy management and energy conservatism by different stakeholders in the energy sector.

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The Relationship between BMI-for-age and Other Factors with Body Fat Percentage among Students in Jakarta, Indonesia

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DOI: 10.29322/IJSRP.10.09.2020.p10546

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10546>

Abstract- This study using the secondary data aims to determine the relationship between the independent variables that included gender, body mass index for age (BMI-for-age), breakfast habits, physical activity, and nutrients intake (energy, carbohydrates, proteins, and fats) with the dependent variable that included body fat percentage (body fat percentage) in adolescents. This is a cross-sectional study that conducted on 131 students of SMAN 39 Jakarta in 2019. The results showed that 53,4% respondents had excess body fat percentage with the average on females $28,59 \pm 5,02\%$ were classified excessive and males $20,8 \pm 5,94\%$ were classified not excessive. There was a significant relationship (p -value $< 0,05$) on gender and BMI-for-age with body fat percentage in student, while there was no significant relationship (p -value $> 0,05$) on breakfast habits, physical activity, and nutrients intake (energy, carbohydrates, proteins, and fats) with body fat percentage in adolescents.. This study suggested that BMI and body fat percentage to stay in normal range by monitoring the body weight and height regularly, conduct sports activities once a week, students should join sports extracurricular, and providing education related to diet and exercise as a prevention of obesity.

Keywords: BMI-for-age, obesity, body fat percentage.

I. INTRODUCTION

Besides facing the undernutrition, overweight or obesity is also a nutritional problem globally and nationally. Obesity is the root cause of various non-communicable diseases, such as cardiovascular disease, diabetes, and cancer [1]. According to World Health Organization (WHO), obesity in the adolescent group is one of the causes of non-communicable diseases in young adults which has caused 71% of global deaths where cardiovascular disease is the largest cause of death in 2016 with a total death toll of 15.2 million. Apart from health, obesity also has an impact on reducing the quality of life of sufferers, individual and state productivity, and high health costs [2].

According to the WHO, overweight and obesity are defined as abnormal conditions or having excess body fat accumulation which can be indicated in various ways, one of which is by measuring the percent of body fat (body fat percentage). body fat percentage is often used in determining the status of overweight and obesity because it can describe the total

fat in the body against a person's body weight, gender, age, and height [3]. Having excess body fat as a teenager is a serious global public health problem in the 21st century. Based on a study in the United States, the median of the body fat percentage in adolescents aged 18 years was 17% in boys and 27.8% in women [4]. The national average of body fat percentage in Indonesia youth is not known. However, a previous study on 267 high school students showed body fat percentage mean of 30.1% in males and 17.7% in females [5]. Globally, obesity at school age and adolescence has increased more than 10-fold over the past 40 years from 11 million to 124 million in 2016 [6].

The high prevalence of obesity and obesity is caused by lifestyle changes that occur in the community, including changes in diet and low physical activity [2]. Changes in people's diet occur due to easy access and variety of foods that are high in energy, high in fat, and high in sugar, which can cause an energy imbalance to occur which increases the risk of excess fat accumulation in adolescents [3]. In addition, having a habit of skipping breakfast can lead to changes in appetite and decreased satiety, resulting in excessive food consumption and a risk of overweight and obesity [7]. In addition to diet, technological advances along with changes in sedentary lifestyle also cause energy imbalances, which can increase the risk of obesity or accumulation of fat in the body [8]. A sedentary lifestyle can lead to decreased muscle mass, persistent accumulation of fat, and an increased the risk of cardiovascular disease [9]. In addition, a high body mass index (BMI) of a person tends to have a high body fat percentage as well [10], [11].

Seeing the high prevalence of obesity, especially among adolescents in Jakarta, the study was conducted with the aim of knowing the factors that associated with the high body fat percentage in adolescence. The high body fat percentage at an early age can increase the risk of chronic disease, including cardiovascular disease, diabetes, and cancer. Therefore, prevention of excessive body fat percentage needs to be addressed from an early age because it is considered easier than when it is adults [12].

II. MATERIAL AND METHOD

This research is a quantitative study using a cross-sectional study design. The independent variables of the study included breakfast habits, nutrient intake (energy, carbohydrates,

protein and fat), physical activity, and BMI-for-age status. The dependent variable to be studied is body fat percentage. This study uses secondary data from last research by Mailani in 2019 entitled "Differences in Cardiorespiratory Fitness Status based on Nutritional Status, Physical Activity, and Other Factors in Students of SMAN 39 Jakarta in 2019 [13].

The number of samples of 131 respondents was obtained using total sampling from secondary data. The data included 10th and 11th grade students who were selected by non-random sampling through an agreement on class selection determined by the school. The inclusion and exclusion criteria of this study were adjusted to the primary study. The primary research inclusion criteria were all students from 10th to 11th grade of SMAN 39 Jakarta who were suggested by the school and students who were physically fit. The exclusion criteria in the primary study were students who had a history of cardiovascular disease and students who were athletes.

The research instruments used in the primary researcher include: research questionnaires (respondent identity, informed consent, physical activity with PAQ-A, breakfast habits, anthropometric data, 24 hours food recall), Kris brand digital weight scales that have been calibrated with accuracy 0.1 kg, GEA brand height scale with 0.1 cm accuracy, Omron brand BIA with 0.1 body fat percentage accuracy, food model, and stationery. In data processing, body fat percentage was categorized as excessive if it had a value of >22% in men and >27% in women. A person is categorized as having a breakfast habit if they have a frequency of breakfast ≥5 times a week. Physical activity is categorized as active if PAQ-A score of ≥3. Based on BMI-for-age, a person is categorized as overweight if they have a score of >1 z-score. In addition, nutritional intake (energy, carbohydrates, protein, and fat) can be categorized as excessive if the intake is >110% Indonesia Recommended Dietary Allowance (RDA). Univariate analysis is presented in the form of frequency distribution tables and proportions and bivariate analysis using the chi-square test to see differences in body fat percentage categories according to independent variables. This research has gone through an ethical review procedure through the Ethics Commission for Research and Community Health Service, Faculty of Public Health, University of Indonesia with letter number Ket-204 / UN2.F10.D11 / PPM.00.02 / 2020.

III. FINDINGS

Below table contained the result of univariate analysis of dependent and independent variables.

Table I: Result of Univariate Analysis

Variable	Amount (n)	Percentage (%)
Body Fat Percentage		
Excess	70	53.4
Not excess	61	46.3
Gender		
Male	52	39.7
Female	79	60.3
BMI-for-age		
Overnutrition	36	27.5
Not-overnutrition	95	72.5

Breakfast Habits		
Not Always	72	55
Always	59	45
Physical Activity		
Less Active	110	84
Active	21	16
Energy Intake		
High	2	1.5
Not High	129	98.5
Carbohydrate Intake		
High	2	1.5
Not High	129	98.5
Protein Intake		
High	20	15.3
Not High	111	84.7
Fat Intake		
High	24	18.3
Not High	107	81.7

Based on the results of univariate analysis, most of the students (53.4%) had excess body fat percentage, with an average body fat percentage in women of 28.59 ± 5.02% which was classified as excessive and body fat percentage in men 20.8 ± 5.94% which is classified as not excessive. Based on the BMI-for-age of the samples, 72.5% of the respondents were overweight. The average BMI for students in 2019 is 22.1±4.13 kg/m² with an average 0.17±1.26 z-score. The average BMI for men was 22.72±4.92 kg/m² and for women was 21.7 ± 3.48 kg / m². There are as many as 55% of respondents have the habit of not having breakfast. As many as 84% of respondents have a low level of physical activity.

The result of bivariate analysis between dependent variable (body fat percentage) and independent variables can be seen in below table.

Table II: Result of Bivariate Analysis

Variable	Not excess Body Fat Percentage		Excess Body Fat Percentage		p-value
	N	%	N	%	
Gender					
Male	33	63.5	19	36.5	0,003
Female	28	25.4	51	64.6	
BMI-for-age					
Overnutrition	59	62.1	36	37.9	0.0001
Not overnutrition	2	5.6	34	94.4	
Breakfast Habit					
Not Always	31	43.1	41	56.9	0.476
Always	30	50.8	29	49.2	
Physical Activity					
Less Active	50	45.5	60	54.5	0.119
Active	11	52.4	10	47.6	
Energy Intake					
Not High	60	46.5	69	53.5	1
High	1	50	1	50	
Carbohydrate Intake					
Not High	59	45.7	70	54.3	0.215
High	2	100	0	0	

Protein Intake					
Not High	50	45	61	55	0,563
High	11	55	9	45	
Fat Intake					
Not High	52	48.6	55	51.4	0.448
High	9	37.5	15	62.5	

Based on the result of bivariate analysis, there is a significant relationship (p-value <0.05) between gender and BMI-for-age with body fat percentage among students. There is no significant relationship (p-value >0.05) between the variables of breakfast habits, physical activity, nutritional intake (energy, carbohydrates, protein, fat) with body fat percentage among students.

IV. DISCUSSION

Based on the result of univariate analysis, the average body fat percentage in this study was higher than the research conducted on adolescents in rural area in Serbia, with an average on body fat percentage $17.9 \pm 7\%$ in boys and $25.1 \pm 5.4\%$ in girls [14]. The difference in the results of this study can be caused by the higher consumption of fast food in urban than in rural areas. Urban areas have easier accessibility to fast food restaurants, especially in shopping center areas that provide a wide variety of fast-food foods, compared to district areas [15]. Fast food has the characteristics of high energy and fat content which are risk factors for obesity and obesity. In addition, excessive consumption of fast food is also triggered by parental work and pocket money for adolescents. Most of the jobs of parents in urban areas are private employees and civil servants, while in district areas are laborers and self-employed. The type of work affects the income of parents, where the income per capita in cities is higher than in districts so that it can increase the purchasing power of consumption and giving pocket money to children in urban areas which is higher [16]. The higher the allowance can increase the frequency of fast-food food in adolescents [17].

The results of this study indicate a significant relationship between gender and body fat percentage in adolescents, where women have more body fat percentage than men. The results of this study are in line with research in Africa which shows that there is a significant difference between body fat percentage according to sex in the children, adolescents, and adults groups [18]. The OR in the results of this study showed that female adolescents had a 3,164 times higher risk of obesity and obesity than boys. The results of this study are supported by a cross-sectional study conducted in Saudi Arabia on adolescents aged 11-19 years, which shows that female adolescents are more at risk of obesity than men [19]. In general, women have higher body fat percentage than men. With the same BMI, a woman tends to have body fat percentage about 10% higher than a man [20]. This could be influenced by the difference in sex hormones and rapid muscle growth in the male group during adolescence which has an impact on increasing lean body mass and reducing body fat percentage in men. In contrast, body fat percentage in women continues to increase significantly [21]. During puberty, the concentration of the hormone testosterone in men increases,

triggering muscle mass growth and fat breakdown or lipolysis, while changes in endocrine hormones in women neutralize the lipolytic effect of growth hormone resulting in an increase in body fat percentage [5]. In this study, there were no significant differences between energy intake, macronutrient intake and physical activity according to gender. However, excessive intake of energy and macronutrients, as well as less physical activity, tended to be dominated by female respondents. Excessive intake of energy and macronutrients with less physical activity will result in excess energy which can be metabolized into body fat [9].

The results of the bivariate analysis in this study showed that there was a significant relationship between BMI-for-age and body fat percentage among students. These results indicate that students who have high BMI-for-age are at risk of having a high body fat percentage. Previous research conducted in Serbia showed similar results, namely that there was a very strong relationship between BMI and body fat percentage in adolescents aged 15-19 years [22]. Another cross-sectional study done in Denpasar, Indonesia also shows a significant positive relationship between BMI and body fat percentage based on BIA measurements in SMA 2 Denpasar students [23]. In addition, the results of a study in Germany in 2015 conducted on 3327 children to adolescents with a median BMI of 29 kg/m^2 found a significant positive relationship between BMI and body fat percentage, and there was no significant difference between BMI and body fat percentage in predicting the risk of cardiovascular disease [24]. However, BMI measurement has a disadvantage in assessing body composition because it is only based on height and weight. Basically, each individual has different fat-free mass and body fat mass [25]. During growth, weight gain and height can affect a person's BMI. Changes in body composition can occur in both women and men. body fat percentage in women tends to increase, while body fat percentage in men tends to decrease during its growth. Moreover, adolescents in Asia tend to have high body fat percentage, but with lower BMI [26]. With the results of this study, it can be concluded that the nutritional status assessment based on BMI-for-age can be used as a simple and inexpensive way to estimate body fat percentage, especially if the measurement does not have BIA tools or competent human resources in measuring body fat percentage with the skinfold method.

Based on the results of the bivariate analysis of this study, it was found that there was no significant relationship between breakfast habits and body fat percentage in adolescents. However, there was a tendency that excessive body fat percentage was higher in subjects who did not always have breakfast (56.9%) compared to subjects who always had breakfast (49.2%). Another study conducted on female adolescents in Surabaya, Indonesia also showed that there was no significant relationship between breakfast habits and nutritional status [27]. There was a study that showed an association between rarely having breakfast (less or equal to 2 times a week) with higher BMI, BMI z-score, and body fat percentage in children and adolescents in Hong Kong [28]. The difference in these results is assumed because the number of samples used in the results that are not significant is less, namely 131 respondents in this study and 80 respondents in Surabaya research, while in the research in Hong Kong have total sample of 11,570

respondents. Thus, the number of samples used in this study could not show a significant relationship between breakfast habits and body fat percentage in adolescents. In addition, it is suspected that there are factors of physical activity, energy intake, and food quality that can affect body fat percentage. According to the results of this study, most or as much as 84% of students have a low level of physical activity. It was found that more active students were higher in the group who always ate breakfast (25.4%) than in the group who did not always eat breakfast (8.3%). This is in line with other research that shows adolescents who have a habit of not having breakfast tend to do sedentary activities, such as spending time sitting, watching television, and playing gadgets [29]. It also added that the habit of not having breakfast can increase food and energy intake throughout the day.

The results in this study showed that respondents with low physical activity were more likely to be found excess body fat percentage (54.5%) than not excess body fat percentage (47.6%). The p -value >0.05 , which means that there is no significant relationship between physical activity and body fat percentage in adolescents. However, there is a tendency that most of the students with excess body fat percentage have less physical activity levels. This research result is in line with other studies conducted on 11,570 adolescent boys and girls aged 9-18 years in Hong Kong which showed a relationship between low exercise frequency and higher body fat percentage [28]. In addition, research conducted on 267 high school students in Depok also showed a significant relationship between physical activity and body fat percentage [5]. This insignificant result in this study is thought to be due to the relatively small sample. As many as 83.97% of respondents have a low level of physical activity, which causes homogeneity in the research respondents and causes an insignificant relationship in the results of this study.

Based on the results of the bivariate analysis, it was found that there was no significant relationship between energy intake and body fat percentage in adolescents. The results of this study are in line with research in Bogor which states that there is no significant relationship between the energy adequacy level and body fat percentage [16]. Contrary to these results, research on 120 adolescents aged 16-18 years in Jakarta showed a relationship between energy intake and overweight status, where the more someone consumed excess energy intake, the more risk of overweight [30]. This difference in results is thought to be influenced by the factor of the sample appearance method used. Stratified random sampling was used as the subject collection method on the research with 50.8% of the subjects having excess nutritional status and 60% of the subjects having more energy intake [30], while the sample collection method in this study was carried out with total sampling of data secondary so as to allow the homogeneity of the research variables. It can be seen that as many as 98.5% of respondents have a level of intake that is not excessive. The food recall that has been carried out allows the occurrence of flat slope syndrome where the reporting of nutritional intake is less than the reality, especially for respondents with excess body fat percentage.

Based on the results of the bivariate analysis, it was found that there was no relationship between carbohydrate intake

and body fat percentage among students. The results are in line with another research in Bogor, Indonesia which found no association between carbohydrate intake and body fat percentage in adolescents [16]. In contrast to these results, research conducted on high school students in Depok, Indonesia shows a relationship between carbohydrate intake and body fat percentage [5]. The relationship that is not related to the results of this study is assumed to be due to the flat slope syndrome when food recalling students of SMAN 39 Jakarta. As many as 98.5% of the research respondents had carbohydrate intake which was classified as not excessive and the average carbohydrate intake still did not meet the 80% Indonesia RDA. This can also be caused by the method of total sampling from secondary data. In fact, consuming excess carbohydrates can increase the total daily energy intake and increase the risk of overweight. In addition, it is suspected that the development of the food or beverage industry has increased the refined carbohydrates and sugar intake [31]. Based on data from Baseline Health Research in 2018, 57.1% of adolescents aged 15-19 years have habits of consuming sweetened drinks at least once per day. An increase in high sugar intake causes rapid blood absorption which cause the increasing of insulin and also followed by a rapid decrease in blood glucose. This increase in insulin results in excess glucose for body fat, causes hunger, and decrease in the metabolic rate, thereby increasing the risk of obesity to insulin resistance [32].

The relationship between protein intake and body fat percentage in adolescents in this study showed that there was no significant relationship statistically (p -value >0.05). These results are in line with a case control study which found that more protein intake in non-obese adolescents was higher than obese adolescents, where the relationship between protein intake and body fat percentage also showed statistical significance [33]. However, the absence of the relationship in this study could be caused by the sample collection method in this study was carried out with total sampling of the secondary data. These allow the homogeneity of the research variables as it shows 84.7% respondents have been categorized as excess protein intake.

The relationship between fat intake and body fat percentage in this study was not statistically significant (p -value >0.05). Similar results were found in a case control study, which stated that fat intake was found to be higher in obese adolescents than non-obese adolescents. In addition, the results of the study also stated that adolescents with excessive fat intake had a 2 times greater risk of being obese than adolescents with sufficient fat intake [33]. The insignificant results in this study were assumed because the sample collection method was the total sampling method from secondary data, which allowed for bias in the study. This can be seen from the number of samples with not excess fat intake that is much higher than excess fat intake, which is as much as 81.7% of all respondents. This can also be caused by the occurrence of flat slope syndrome during the food recall.

V. CONCLUSION AND RECOMMENDATIONS

Most of the students of have excess body fat percentage, with an average body fat percentage in women $28.59 \pm 5.02\%$ which is classified as excessive and body fat percentage in men

20.8 ± 5.94% which is classified as not excessive. There is a significant relationship (p-value <0.05) between gender and BMI-for-age with body fat percentage among students. There is no significant relationship (p-value >0.05) between variables of breakfast habits, physical activity, nutritional intake (energy, carbohydrates, protein, fat) with body fat percentage among students.

It is suggested that the school can routinely organize sports activities, oblige all students to take part in sports extracurricular activities, and provide education related to balanced nutrition for adolescents. In addition, the local public health center together with the school conduct regular and periodic measurement to monitor adolescent nutritional status.

ACKNOWLEDGMENT

Authors are grateful to all the teachers & students involved in the study for their cooperation.

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Assessment of Heavy Metals and Pesticide Residues in Honey Samples Collected From Selected Villages in Five Local Government Areas of Adamawa State, Nigeria

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DOI: 10.29322/IJSRP.10.09.2020.p10547

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10547>

Abstract: *This study was designed to assess the heavy metals and pesticide residues in honey samples collected from selected villages in Adamawa state, Nigeria. A total of five (5) different natural samples of wild harvested honey were bought from the honey harvesters in Dulwarchira, Gada, Gurum, Kwaja and Muva villages. Heavy metals in the honey samples were determined using Atomic Absorption Spectrophotometer, while pesticides residues were determined using High Performance Liquid Chromatography. The results show that honey sample from Gada contains high concentration of Cr and Mn. Fe and Cd were found to be highest in samples collected from Kwaja. The concentration of Pb was found to be highest in samples collected from Muva even higher than the permissible dose. The sample collected from Muva and Gurum are rich in essential metal Zn. Aldrin was detected in all the villages (Dulwarchira, Gada, Gurum, Kwaja and Muva) with the highest value recorded in Gurum (0.021 ± 0.03). Alpha-BHC were detected in Dulwarchira, Kwaja and Muva with the highest value recorded in Dulwarchira (0.032 ± 0.10). The levels of p-DDT were detected in Gada, Gurum and Muva. Deldrin levels in honey samples were recorded in Dulwarchira, Gada, Kwaja and Muva. Levels of Endosulfan I, Endosulphan II and Endosulfan Sulphate were detected in honey samples from Dulwarchira, Kwaja and Muva while not detected in samples from Gada and Gurum villages. Heptachlor (organochlorines) pesticide were also detected in honey samples from Dulwachira and Gada villages and not detected in samples from Gurum, Gada and Muva. Chlorpyrifos were detected in Gurum and Kwaja. Diazinon was found in honey samples from Dulwachira and Gurum. Dichlorovos were also detected in honey samples from Dulwachira, Gada, Gurum and Kwaja. Fenitrothion in honey samples from the different villages were recorded in Gada and Gurum. Fenithion residues were found in honey samples from Kwaja and Muva villages. Bifenthrin were detected in samples from Gada and Gurum. Cypermethrin were recorded in samples from Dulwachira, Gurum, Kwaja and muva villages. Permethrin residues were detected in honey samples from Dulwachira and Kwaja with the highest value recoded from Duwachira. From this study, it can be concluded that honey samples from these areas contain Fe, Zn, Cu and Mn at high concentrations which were virtually above the maximum permissible limits prescribed by FAO/WHO. While Pb was below the permissible limits prescribed by FAO/WHO.*

Keywords: Honey, Heavy metals, Pesticides residue, Assessment, AAS.

Introduction

Recent clinical and epidemiological studies show that honey may act as an important mediator of human health (Khalil and Sulaiman, 2010; Eteraf-Oskouei, and Najafi, 2013; Samarghandian *et al.*, 2017; Cianciosi *et al.*, 2018; Nguyen *et al.*, 2019). Honey is a natural substance which has been used as a sweetener for thousands of years, is produced by honey bees (*Apis mellifera* and *Apis dorsata fabriciosus*) from the nectars of plants. Its chemical consumption is influenced by its botanical origin, mode of processing, seasons, and environmental conditions (Cianciosi *et al.*, 2018; Khan *et al.*, 2017). Honey is not only considered as food or a sweetener, its consumption has long been regarded as having beneficial effects on human health, as described in early Greek, Roman, Vedic, and Islamic texts (Hossen *et al.*, 2017).

In addition, more recent *in vitro* and *in vivo* studies have confirmed that honey possesses a range of antioxidant, antimicrobial, antiviral, anticancer, and antidiabetic properties, and it has been shown to demonstrate protective activities on the nervous, cardiovascular, gastrointestinal, and respiratory systems (Khalil and Sulaiman, 2010; Eteraf-Oskouei, and Najafi, 2013; Samarghandian *et al.*, 2017; Cianciosi *et al.*, 2018). It has been found that the effect of honey on the cardiovascular system depends on the bioavailability of various phytochemical compounds, and on their methods of absorption and metabolism (Cianciosi *et al.*, 2018). Honey has some myriad health benefit as it could be used to treat coughs and sleep difficulty in children associated with childhood upper respiratory tract infection (Punch newspaper, 2020). Cenat *et al.* (2015), reported that honey has variation in taste, colour, and smell depending on the nectars of flowers, and the content of various plant pigments, especially carotenoids. (Khalil and Sulaiman, 2010) also described a correlation between colors. Honey is produced almost all over the world, with global production estimated to be approximately 1.2 million tons (Bogdanov *et al.*, 2008).

The main source of heavy metal concentration in honey has been traced to the soil; being transported to honey plants via the root system, passing to the nectar and eventually to the honey produced by the bees (Stankovska *et al.*, 2008). However, there is evidence that the presence of heavy metals in honey can emanate from anthropogenic factors (Bogdanov, 2006). Heavy metals originate from two primary sources; natural sources and anthropogenic sources including metalliferous mining and industries, agrochemicals and mineral fertilizers, vehicle exhaust, sewage sludge and industrial wastes (Jiao *et al.*, 2015). According to (Aljedani, 2017) although the metals poison the bodies of honey bees, the honey bees are still able to travel great distances in the search for food and may not die directly from the poisoning of these metals. The metals, however, accumulate in their bodies helping them to play the role of detecting heavy metals in the environment. The evaluation of heavy metals content in honey has a twofold significance: the former one lies in the toxicity of these metals, with the consequent necessity to develop adequate analytical procedures for their monitoring; the latter one is suggested by the possibility of using bees and their products as bio-indicator.

Chemical pesticides are conventionally synthetic materials that directly kill or inactivate the pest (Rama *et al.*, 2011). Depending on their chemical properties they can enter the organism, bio accumulate in food chains and consequently influence also human health (PAN Europe, 2010). Pesticides use is usually accompanied with deleterious environmental and public health effects. Pesticides hold a unique position among environmental and public health effects. Pesticides hold a unique position among environmental contaminants due to their high biological activity and toxicity (acute and chronic). Although some pesticides are described to be selective in their modes of action, their selectivity is only limited to test animals. Thus pesticides can be best described as biocides i.e., capable of harming all forms of life other than the target pest (Zacharia, 2011).

MATERIALS AND METHOD

Equipments

Refrigerator, Analytical balance, Auto sampler G4513A, High Performance Liquid Chromatography (HPLC), Atomic absorption spectrophotometer (AAS).

Chemicals

- Concentrated HNO₃, H₂O₂ and H₂SO₄.
- Deionized water
- Hydroquinone 1, 10-phenanthroline hydrate.
- Sodium acetate trihydrate
- Ferrous ammonium sulfate hexahydrate

Collection of Samples

A total of five (5) different natural samples of wild harvested honey were bought from the honey harvesters in the different Metropolis. One hundred grams (100 g) each of the samples was stored in cleaned labeled glass jars, kept at room temperature and in the dark until analysis.

Determination of Heavy Metals in Honey

Five grams (5g) of the honey was weighed using an analytical balance, transferred into a beaker, digested using oxi-acidic mixture of NO₃/H₂ O₂ and filtered into a 50ml volumetric flask. This mixture was heated up to 120°C for 3hr and brought to a volume of 25ml with deionized water. The blank digestions were repeated using the same procedure (AOAC. 1985; Mbiri *et al.*, 2011). Blanks were prepared to check for background contamination by the reagents used. For quality assurance, honey samples were digested thrice along with blanks to minimize error. All reagents were of analytical reagent grade. Double distilled deionized water (Milli-Q Millipore 18.2 MΩ-cm resistivity) was used for all dilutions. The instrument was calibrated with a series of standard solutions supplied by a reputable company. Also, all metal content determinations were performed with five replications. The digested honey samples were analyzed for the heavy metals (Cd, As, Pb, Cu, Ni, Mn, Cr and Zn) using atomic absorption spectrophotometer.

Pesticides Analysis

Five (5) samples of row honey was obtained from five selected villages from bee farmers of five different local government areas of Adamawa state Nigeria. The extraction and purification of the pesticides (organochlorine, organophosphate and pyrethroid) residues from the honey samples prior to instrumental analysis was carried out based on the procedure described by Lehotay *et al.*, (2005). Five (5) grams of honey sample was taken and dissolved in 10 ml of de-ionized water. 10ml of acetonitrile acidified with acetic acid was added, 1.0 g sodium acetate and 4.0 g anhydrous magnesium sulphate was shaken for at least a minute. And further shaken vigorously for another one minute. Following the centrifugation at 4,000 rpm for 2 minutes, 6 ml of the extract was transferred into 15 ml glass tube containing 0.4 g primary and secondary amine (PSA) sorbent and 0.6 g anhydrous magnesium sulphate. The formed mixture was vigorously shaken for 1 minute and centrifuged at 4000 rpm for 2 minutes. The residue was dissolved in 2 ml of injection standard and passed through a 0.50 µm sized pore filter and quantified by HPLC.

RESULTS AND DISCUSSION

Table 1 shows the results of heavy metals results in honey samples collected from different villages in Adamawa State. Concentration of metals in honey sample from Gada contains high concentration of Cr and Mn. Highest concentration of Cu was recorded in samples from Dulwachira. Iron an essential element was highest in samples from Kwaja. Cd a non-essential element was highest in samples collected from Kwaja. The poisonous metal Lead (a non-essential element) was found to be highest in samples collected from Muva higher than the permissible dose. The sample collected from Muva and Gurum are rich in essential metal Zn. Concentration of Cd was slightly higher than the permissible range in this sampled.

Naturally, lead is found in the earth's crust and has been associated with illness in children and adult especially cardiovascular related diseases. Acute lead poisoning in humans causes severe damage in the kidneys, liver, brain, reproductive system and central nervous system, and even causes death (Dhahir and Hemed, 2015). Lead (Pb) residues in food are mostly

linked to human activities such as farming, industrial and vehicular emissions and storage places. In this study, lead concentration in the honey samples was below the tolerable dose. The presence of lead may be due to the frequent farming activities and heavy vehicular emissions from the study area. Lead (Pb) in this study happens to be in little concentration than Cd, Cr, Zn, Cu, Mn, and Fe respectively. All the trace elements detected were below the permissible limits of <50mg/g. The number of different minerals and heavy metals in honey may be largely dependent on the soil composition, as well as various types of floral plants, because minerals are transported into plants through the roots and are passed to the nectar and finally into the honey produced from it (Chukwujindu *et al.* 2015). Also, the beekeeping practices, environmental pollution, and honey processing also contribute to the diversified mineral content found to be present in honey (Pohl, 2009). Another key trace mineral detected in both honey sample is Manganese, which acts as co-factor for up to 300 enzymes most of which are related to antioxidant reactions. Manganese deficiency contributes to aging and age-related disorders (Huskisson *et al.*, 2007).

Manganese is required by the body for enzyme functioning, nutrient absorption, wound healing bone development. The element manganese deficiency results in poor bone growth, joints pains and related fertility problems. The results of Mn obtained in this study is contrary to the work of Chukwujindu *et al.* (2015) who reported highest concentrations of Mn (31.75 mg/kg) in honey samples from Calabar. Some other benefits of manganese include; preventing anemia, alopecia, alleviating premenstrual syndrome, epileptic seizures and antioxidant protection. Mn may also be contained in foods such as, whole grains, beans, nuts, okra and cocoa. Mn is one of the most abundant metals in the soil and normally occurs as oxides and hydroxides. Its effects in the body mostly occur in the respiratory tract and the brains. Some symptoms of manganese poisoning include; forgetfulness and hallucination. Manganese causes Parkinson disease and impotency in men when exposed for a longer time. The elevated levels of Mn in the honey samples from the study areas may be due its presence in the dust through the air, industrial activities, burning fossil fuels and the surface waters. The study also reported the pollution of Cu in the honey samples. Other heavy metals detected in the honey from the Dulwachira, Gada, Gurum, Kwaja and Muva includes Cd, Cr, Zn, Cu and Fe. The presence of these toxic metals in honey samples is an evidence of some micro polluting agents in the environment.

Most elements detected from honey samples are useful for good health at optimum concentrations, especially when they originate from plant or organic source, rather than that of inorganic and metallic source. They will have five times the specific gravity of water and become toxic. At this stage they are referred to as heavy metals. Which are known to be toxic or poisonous at low concentration because of their tendency to accumulate in living organism. Thereby leading to toxicity in humans. The toxicity occurs due to the inability of the heavy metal to be metabolized by the body, leading to accumulation in human or animal soft tissues without being fully inactivated or destroyed (Ajibola *et al.*, 2012). Health problems caused by heavy metals include headaches, metabolic abnormalities, respiratory disorders, nausea, and vomiting. For instance, lead can cause damage to the brain, kidney, nervous system, and red blood cells (Chukwujindu *et al.* 2015).

Table 1: Heavy Metals residues in the Honey Samples (µg/kg)

Parameters	Dulwarchira	Gada	Gurum	Kwaja	Muva
Chromium	0.013±0.01 ^a	0.019±0.01 ^a	0.013±0.02 ^a	0.015±0.01 ^a	0.012± 0.01 ^a
Copper	0.55±0.30 ^b	0.43±0.10 ^a	0.12±0.10 ^c	0.31±0.10 ^d	0.43±0.03 ^a
Iron	1.11±0.50 ^c	1.21±0.15 ^c	1.81±0.50 ^a	1.92±0.13 ^a	1.71±0.10 ^a
Cadmium	0.022±0.01 ^d	0.042±0.01 ^a	0.042±0.03 ^a	0.052±0.03 ^b	0.050±0.01 ^b
Lead	0.012±0.01 ^a	0.013±0.01 ^a	0.012±0.01 ^a	0.012±0.01 ^a	0.016±0.01 ^a
Zinc	2.46±0.30 ^a	2.12±0.10 ^a	3.21±0.13 ^b	3.06±0.15 ^b	3.56±0.10 ^c
Manganese	6.35±0.540 ^a	13.15±0.53 ^b	12.63±0.51 ^b	8.06±0.14 ^a	8.76±0.15 ^a

Values are mean ± SD. Values with the same superscript are statistically not significant (p<0.05)

Table 2: shows the results of organochlorines pesticides residues in honey samples from different locations in Adamawa State.

Aldrin was detected in all the villages (Dulwarchira, Gada, Gurum, Kwaja and Muva) with the highest value recorded in Gurum (0.021 ± 0.03). Alpha-BHC were detected in Dulwarchira, Kwaja and Muva with the highest recorded in Dulwarchira (0.032 ± 0.10). The levels of p-DDT were detected in Gada, Gurum and Muva. Deldrin levels in honey samples were recorded in Dulwarchira, Gada, Kwaja and Muva. Levels of Endosulfan I, Endosulphan II and Endosulfan Sulphate were detected in honey samples from Dulwarchira, Kwaja and Muva while not detected in samples from Gada and Gurum villages. Heptachlor (organochlorines) pesticide were also detected in honey samples from Dulwachira and Gada villages and not detected in samples from Gurum, Gada and Muva.

Table 3 shows the organophosphates pesticides residues in honey samples from different villages of Adamawa State. Chlorpyriphos were detected in Gurum and Kwaja with Gurum having the highest value (0.0030 ± 0.011). Diazinon were found in honey samples from Dulwachira and Gurum the highest being recorded in sample from Gurum. Dichlorovos were also detected in honey samples from Dulwachira, Gada, Gurum and Kwaja with the highest value recorded at Gada (0.0034 ± 0.001). Fenitrothion in honey samples from the different villages were recorded in Gada and Gurum with the highest value recorded in samples from Gada (0.0034 ± 0.001). Fenithion residues were found in honey samples from Kwaja and Muva villages with the same concentration.

Table 2: Organochlorines pesticides residues in the Honey Samples (µg/kg)

Pesticides	Dulwachira	Gada	Gurum	Kwaja	Muva
Organochlorines					
Aldrin	0.025±0.10 ^a	0.013±0.01 ^b	0.021±0.03 ^a	0.015±0.01 ^b	0.011±0.01 ^b
Alpha-BHC	0.032±0.10 ^b	ND	ND	0.012±0.01 ^a	0.012±0.01 ^a
o, P-DDT	ND	0.012±0.01 ^a	0.012±0.03 ^a	ND	0.013±0.02 ^a
Deldrin	0.025±0.30 ^a	0.013±0.01 ^b	ND ND	0.011±0.03 ^b	0.013±0.01 ^b
Endosulfan I	0.011±0.01 ^a	ND	ND	0.015±0.05 ^a	0.012±0.02 ^a
Endosulfan II	0.015±0.03 ^b	ND	ND	0.012±0.01 ^b	0.013±0.03 ^b
Endosulfan Sulphate	0.014±0.01 ^a	ND	ND	0.013±0.01 ^a	0.013±0.01 ^a
Heptachlor	0.014±0.03 ^b	0.011±0.01 ^b	ND	ND	ND

Values are mean ± SD. Values with the same superscript are statistically not significant (p<0.05). ND = Not Detected

Table 3: Organophosphates pesticides residues in the Honey Samples (µg/kg)

Pesticides	Dulwachira	Gada	Gurum	Kwaja	Muva
Organophosphates					
Chlorpyrifos	ND	ND	0.0030±0.011 ^a	0.0022±0.001 ^b	ND
Diazinon	0.0011±0.001 ^a	ND	0.0023±0.001 ^b	ND	ND
Dichlorovos	0.0022±0.001 ^a	0.0034±0.001 ^b	0.0033±0.010 ^b	0.0012±0.001 ^c	ND
Fenitrothion	ND	0.0034±0.001 ^b	0.0011±0.001 ^a	ND	ND
Fenthion	ND	ND	ND	0.0012±0.001 ^a	0.0012±0.001 ^a

Values are mean ± SD. Values with the same superscript are statistically not significant (p<0.05). ND = Not Detected

Table 4 shows the pyrethroids pesticides residues in honey samples collected from different villages in Adamawa State. Bifenthrin were detected in samples from Gada and Gurum. Cypermethrin were recorded in samples from Dulwachira, Gurum, Kwaja and muva villages. Permethrin residues were detected in honey samples from Dulwachira and Kwaja with the highest value recoded from Duwachira.

The pesticides analysis was carried out for determination of different classes of compounds (organochlorines, organophosphates and pyrethroids). The result showed the presence of residual concentration in all honey samples. This is contrary to the results obtained by Bogdanov, (2006) who reported no measurable residues of insecticides in honey. The results were compared with the maximum residue limits (MRLs) for pesticides in honey (EC, 2005, Darko *et al.*, 2017). The MRLs for pesticides in honey were adopted from European MRL due to lack of available MRL for honey in Codex ~ 1409. The results from this study agrees with several studies detecting residual level of pesticides in honey (Bwatanglang *et al.*, 2019). Bwatanglang *et al.* (2019) reported residual levels of pesticides in honey samples collected along Mbu-Yola road Adamawa State. Pesticide residues in honey samples collected from Hong and Mubi, Adamawa State was also reported by (Bwatanglang *et al.*, 2019) similar to this study. Panseri *et al.* (2014) reported the presence of organochlorines pesticides in honey samples. Several investigations conducted on different types of honey through various analytical methods (Buldini *et al.*, 2001; Zhu *et al.*, 2008; Zhang *et al.*, 2011; Blasco *et al.*, 2011) showed the presence of pyrethrins and pesticides in honey from India (Mukherjee, 2009) and Spain (Herrera *et al.*, 2005), respectively. In another study on honey from Spain and Portugal, residues of 42 different pesticides were examined (Blasco *et al.*, 2003; Blasco *et al.*, 2004) and most of the compounds found were organochlorines, like gamma-HCH, HCB and its isomers α-HCH and β-HCH, with concentrations ranging from 0.03 to 4.31 mg kg⁻¹, but most of them were below 0.5 mg kg⁻¹.

Table 4: Pyrethroids pesticides residues in the Honey Samples ($\mu\text{g}/\text{kg}$)

Pesticides	Dulwarchira	Gada	Gurum	Kwaja	Muva
Pyrethroids					
Bifenthrin	ND	0.0021 \pm 0.001 ^a	0.012 \pm 0.001 ^a	ND	ND
Cypermethrin	0.0012 \pm 0.003 ^a	ND	0.0100 \pm 0.001 ^a	0.0012 \pm 0.001 ^a	0.0012 \pm 0.001 ^a
Permethrin	0.0031 \pm 0.001 ^a	ND	0.0023 \pm 0.001 ^a	0.0026 \pm 0.003 ^a	ND

Values are mean \pm SD. Values with the same superscript are statistically not significant ($p < 0.05$)

CONCLUSION

From this study, it can be shown that Iron (Fe), Zinc (Zn), and Copper (Cu) and Manganese (Mn) reported high concentrations which were virtually above the maximum permissible limits while Lead (Pb) was below the permissible limit as prescribed by FAO/WHO. Their high presence in the honey was probably due to the proximity of agricultural pesticides, emissions, use of fertilizers and the frequent cultivation of crops such as corn. Other heavy metals residues such as Cr and Cd were low and within the permissible limits proposed by WHO/FAO.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

ACKNOWLEDGEMENT

The authors are grateful to Laboratory Technologists, in person of Mr. Iliya Kaigama from Department of Pure and Applied Chemistry, Adamawa State University, Mubi for his professional guide for the success of the research.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Occupational Health and Safety in Chemical Engineering Laboratory

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DOI: 10.29322/IJSRP.10.09.2020.p10548
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10548>

Abstract- Chemical engineering laboratory desires to spread over occupational health and safety to decrease some issues as fire and toxicity. Consequently, to develop about occupational health and safety, the workers, and students in chemical laboratories in hospitals should be given some information and awareness of how to utilize occupational health and safety. This paper pursues to explore the effect of occupational health and safety on employees' chemical engineering laboratory. It also explores the different categories of hazardous factors in the health of labor

Index Terms- Chemical engineering, occupational health, and safety.

I. INTRODUCTION

Occupational health and safety are considered one of the most important controversial issue in the improvement of medical field. The German philosopher, Schopenhauer (Young 2013) highlighted the significance of health by declaring the golden rule " health is not everything, but without health, everything is nothing". Thus, a detailed description of health, safety, and integration can both be seen as occupational health and safety is a universal methodology to overall worker welfare at work (Amponsah-Tawiah 2013).

Based on the World Health Organization (WHO) (Team 2020), occupational health incorporates procedures for medical effort, industrial sanitization, work consciousness, protection, rehabilitation, and ergonomics. Safety, alternatively, necessitates safeguarding workers from physical injury (Hughes and Ferret 2012). Studies stated that many industrial incidents that happened accidentally are because of deficiency of understanding and competency at the correct time. Worker security and wellbeing aptitude is a significant key to a modern procedure. Acquiring, keeping up, and fortifying these skills is required from an the natural, monetary, and social perspective (Perrin, Gabas et al. 2018).

Comprehensively, wellbeing and word related wellbeing costs have expanded. Worldwide monetary misfortunes because of work environment wounds and unforeseen weakness surpass \$ 1250 billion (Organization 2003). With traditionalist evaluations, laborers experience the ill effects of 270 million word related mishaps and 160 million word related illnesses every year (Jilcha and Kitaw 2017).

II. CATEGORIES OF HAZARDOUS FACTORS IN THE HEALTH OF LABOR

Risky elements in the strength of work are commonly grouped into three main categories as follows:

1.1 CHEMICAL FACTORS

This type of factors includes unsafe elements and ordinary elements or carcinogenesis from synthetic compounds utilized and their arrangement. However, unsafe allergens could be expanded just as during circumstances where satisfactory fixations have been expanded, for example, formaldehyde at 5-> 0.5 parts per million (ppm) and vinyl chloride monomer (VCM) at 500 - > 2.5 ppm (Zubar, Visagavel et al. 2014). Likewise, it is extremely important to decide the hazard appraisal of cancer-causing agent introduction through a moderately quantitative assessment to forestall the rise of significant medical issues in the realm of work.

Likewise, processes to regulate presentation to harmful elements, for example, ventilation and respiratory insurance gear, for example, gas masks. By and large, gas masks comprise of a canned safeguard, air pipe hardware, and chamber cover. At the ends of the last century, this sort of mask was rendered for a solitary utilization and was light. Subsequently, the plan proposes high-productivity execution and high assurance for individuals utilizing the hardware. Maybe the main issue that emerges from this new plan is that covers can be troublesome to utilize through more smoking summer season.

A gas mask is a cover utilized to protect the wearer from breathing in airborne toxins and poisonous gases. The gas mask shields the client from processing, breathing in and contact through the eyes (numerous operators influence through eye to eye connection). There are many types of this mask (i.e. gas mask) like MIRA Safety CM-7M Military Grade Gas Mask and MIRA Safety CM-6M Tactical Gas Mask (Moreno, Susmozas et al. 2020).

1.2 PHYSICAL FACTORS

This type of hazardous factors remember conditions for which high temperatures and weights are involved (for instance, the individuals who work in cryogenic or underground examinations). Based on these specifications, principles, and fixes to mishap counteraction due to long haul introduction should be considered explicitly. Likewise, different perilous factors, for example, presentation to little radiation levels on phones to bright and infrared beams in the electromagnetic range from the utilization of excimer lasers have been analyzed. Such lasers (all the more explicitly known as "exciplex lasers") are types of bright

lasers that are regularly utilized in the creation of electronic gadgets, for example, semiconductors.

In light of long working hours as well as quick creation pressure, numerous laborers experience issues that run from nerve exhaustion and lumbago to the cervicobrachial condition. In any case, in view of mechanical advancements that started in the last part of the 1970s, the plan and utilization of robots were utilized to supplant laborers, in order to decrease the physical results of laborers (Mytelka and Smith 2002).

1.3 PSYCHOLOGICAL FACTORS

Detrimental psychological factors, particularly those brought about by business related pressure matters, have extended significantly after the turn of the 21st century. As indicated by an examination of center and old specialists, mental problems due to stress represent around 66% of members. Then again, in light of an expansion called technostress (or worry because of the presentation of new advances) the Ministry of Health, Labor and Welfare has directed an effect examination that centers around the propensity of disturbance from mechanical advancement (Fitriah 2019).

The side effects of this hazard in associations can bring about expanded non-appearance, high staff turnover, disciplinary issues, brutality, and mental badgering, decreased efficiency, just as diminished consideration, errors, and mishaps. Elements, both inside and outside the working environment, can impact laborers' wellbeing.

III. SCOPE OF WORK

Recently, the desk review approach performed by researchers is accumulated depending on data bases acquired from the results of occupational health and safety research in creating nations, research discoveries from planned reasonable turn of events, from research that shows the connection between employer stability and advancement identified with manageable turn of events, and the expense of mishaps from various examination databases.

A study executed by (Fitriah 2019) demonstrates that reactions about the experience of development in the work environment (6.89%), representatives know about word related wellbeing and security (12.12%), advancement in the working environment diminishes injury costs (85.43%), personal satisfaction improvement in decreasing dangers in the work environment (87.55%) and gathering conversation (95.44%). This investigation tells that development underpins the progress of the working environment condition via ceaseless advancement devices with the goal that the workplace gets settled. Thusly, the continuous advancement of a highlight is quickened because of a decrease in working environment mishaps, sickness, and injury costs. The study states that working in protected and solid conditions improves worker execution, expands their inspiration and adequacy, increment business efficiency, and therefore improves item quality and decreases costs. also, increment deals and income over the long haul. The nature of items created in the organization influences the wellbeing of the network in the network and altogether impacts the earth where individuals work and live.

Beside the representatives, chemical engineering students should likewise comprehend the wellbeing and security of work that is required when in the research facility (Perrin, Gabas et al. 2018):

1. Comprehend the inborn idea of wellbeing and counteraction of misfortunes and the primary wellsprings of risk in substance forms related with blasts and harmfulness.

2. Comprehend the standards of hazard evaluation and wellbeing the executives and can apply methods for appraisal and decrease of procedures from item perils.

3. Comprehend the technique for distinguishing process dangers, and survey natural effects.

4. Deal with explicit parts of security and natural issues, for example, commotion, risky region grouping, help, and slowdown.

2. Know about the neighborhood administrative structure and how this applies to wellbeing, wellbeing, and ecological administration practically speaking and work environments, from the viewpoint of everybody included, including all partners, administrators, architects, contractual workers, scientists, guests, and the general population.

IV. CONCLUSION

Chemical engineering comparable to wellbeing standards must be a need. Despite the fact that the joining of security with chemical engineering training is significant, it is not sufficiently wide. It has been noticed that few significant snags for developing wellbeing training still altogether hinder advancement and acknowledgment in colleges.

The synthetic building division in the clinical field must change and keep on altering their way to deal with wellbeing usage. Most likely, a superior technique would be the third referenced strategy which comprises of including continuously and at the same time thorough presentation to center concoction building courses including issues applied to wellbeing also.

To put it plainly, training in wellbeing is a troublesome crucial an imposing test that suggests a significant instructive responsibility. Since scholarly projects from college majors are constantly over-burden, showing security for undergrad and graduate chemical engineering understudies ought to concentrate more on essential procedure wellbeing themes, to abstain from dissipating the subject.

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Applications of Shape Memory Alloys in Biomedical Engineering

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DOI: 10.29322/IJSRP.10.09.2020.p10549
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10549>

Abstract- Shape Memory Alloys (SMA) playing significant role in wide range of biomedical applications. The unique thermomechanical properties of SMA attracting researchers and manufacturer in medical field to develop super-elastic biomaterials for clinical applications. Recently, SMA biomaterials are used successfully in surgical fields including; orthopedics, dental and vascular.

Index Terms- Shape memory alloys (SMAs), Nickel-Titanium alloys, Crystallography, Thermomechanical, Austenite and Martensite phase.

I. INTRODUCTION

Memory shape Alloys (SMAs) compose of metallic materials that have unique and attractive characteristics. SMAs are able to return to their original shape after subjected to large deformation load by unique feature known as pseudoelasticity. As well as, memory shape effect enabling SMAs to recover original shape after the effect of heat by thermochemical deformation. However, SMAs show high restitution forces during limitation of original shape return [1].

Interestingly, the peculiar properties of SMAs are characterized by crystallography structure and thermodynamic features. In addition to that, stability and symmetry at high temperature playing significant role during austenitic phase. In parallel to that, stability at low temperature promotes martensitic phase. Totally, the transformation between austenite and martensite is associated with stress-temperature function stimulated a thermal diffusion less thermoelastic martensitic transformation (TMT). In practical, SMAs found in two well-known crystallographic phases; martensite phase is characterized by high level of stability during no stress load at low temperature. Martensite phase is stimulated by temperature or stress load to form monoclinic or orthorhombic structure. While, austenite phase shows stable crystal structure with body center cubic orientation during high temperature only [2, 3].

The functional properties of SMAs influenced the researchers in medical field to successfully introduce these materials in medical applications. Wide range of metal shape memory alloys specially based on Nickel, Titanium, Chromium and Cobalt are suggested to play significant role in medical devices and medical implants regarding to their unique response of human tissues. Mainly, biocompatibility of metal shape memory alloys provides very interesting profile when interacted with human tissues as host, leading to accept SMAs without

undesirable immunity response, allergic reactions, inflammatory or chronic problems. Also, other properties promote the applications of SMAs such as; high level of resistance to fatigue and corrosion, low stiffness and wider range of elastic behavior [4].

Recently, most SMAs used in medical applications are produced based on Nickel-Titanium alloys (*Ni-Ti*) regarding to excellent workability during martensite phase, good resistance to corrosion and high level of biocompatibility. Practically, several researches and studies have been performed to investigate and analyze these properties during medical applications of SMAs. In 1997, Wever and his team examined and compared the thermomechanical behavior and biocompatibility profile between (*Ni-Ti*) alloys, stainless steel and pure titanium. The obtained results showed that (*Ni-Ti*) alloys provide high resistance to corrosion and good biocompatibility profile compared with conventional biomaterials introduced in medical applications [5]. Another study which was performed by Ryhanen in 2000 to evaluate cytotoxicity and corrosion rate of (*Ni-Ti*) alloys by using osteoblast and fibroblast cell culture. Interestingly, the results showed that (*Ni-Ti*) alloys are safe to use indirect contact with human tissues because no toxic effects, no inhibition of cell growth and proliferation. In addition to that, SMAs based on Ti-Ni showed better performance rate of femoral bone osteotomies, higher resistance to corrosion and better treatment outcomes compared with stainless-steel [6]. Furthermore, several studies *in-vivo* and *in-vitro* achieved during the last decade to review the properties of SMAs specially cytotoxicity and genotoxicity. Es-Souni et al 2005, found that SMAs based on (*Ni-Ti*) alloys have superior characteristics including good biocompatibility, good corrosion rate, low cytotoxicity and low genotoxicity compared with traditional metal alloys [7].

In addition to that, surface properties of SMAs playing significant role in biocompatibility profile and corrosion. For example (*Ni-Ti*) alloys, showed that Ti is oxidized faster than Ni to produce TiO_2 , which generates protected film against Ni release and increasing the corrosion resistivity [8].

II. METHODOLOGY

The special thermomechanical behavior of SMAs including pseudoelasticity and shape memory return promote innovative applications in medical applications. SMAs have the ability to perform reversible martensitic transformation by variation of crystal structure depending on variation in load and temperature. Radical differences in crystal structure are appeared

based on yield and elastic points below and above glass transition temperature. The stress-strain curve of SMAs show that elastic module is high at temperature below glass transition temperature, and low at temperature above glass transition temperature. However, the initial phase of transformation is described as macroscopically homogeneous and it occurs before the stress-strain knee. While during yield point localized transformation occurred and described as band area. At higher strain more deformation occurred and more band area appeared leading to overlap and increasing the SMAs' temperature followed by significant increase of transformation stress.

Pseudoelasticity and shape recovery effects occur when SMAs are subjected to load at temperature above austenitic phase, the load causes elastic response until critical value at point A in figure 1. Followed by the martensitic transformation ending at point B. higher stress value leading to elastic recovery phase from point B to point C. After that, reverse martensitic transformation is shown by elastic discharge from point C to point D. However, the curve of forward transformation does not correspond with reverse transformation curve meaning hysteresis loop of energy dissipation.

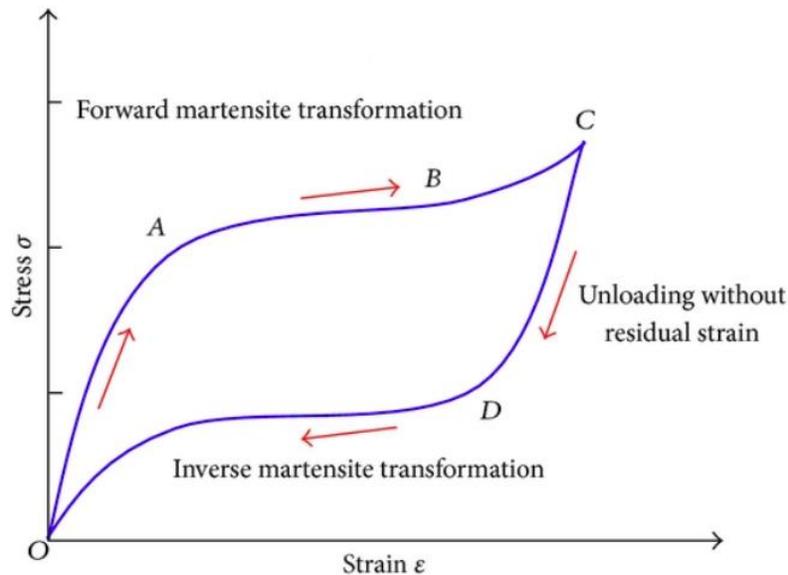


Figure 1: Stress-Strain Curve of SMAs

III. MEDICAL APPLICATIONS

The remarkable properties of SMAs promoted wide range of medical applications in different fields such as Orthopedic, Cardiovascular, and Orthodontic.

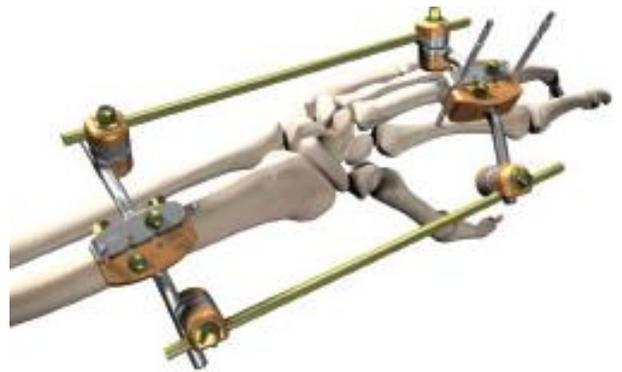
i. Orthopedics

SMAs are widely used in orthopedics surgeries regarding to their thermomechanical features. For example, fixation plates made of SMAs are used to reunion broken bone and maintain

correct alignment of bone during healing stage. As well as, fixation plates should provide suitable compression between the two segments. SMAs can provide the previous features and have the ability to support human bone healing with good biocompatibility, high resistance for corrosion and provide appropriate compression to enhance bone growth [9]. Moreover, stability of SMAs at room temperature is significant to promote easily shaped and facilitate insertion of fixation device during surgery. Figure 2 presents two types of external devices used for Tibia, hand and wrist fixation.



Figure 2: a. Tibia Fixation Device



b. Hand and Wrist Fixation Device

Significantly, SMAs are used for spinal vertebra spacer as shown in figure 3. The main purpose of vertebra spacer is to

prevent any traumatic motion during healing stage of spinal cord injuries. However, SMAs spacer promote healing and recovery of spinal to its original shape by the pseudoelastic phenomenon [10].

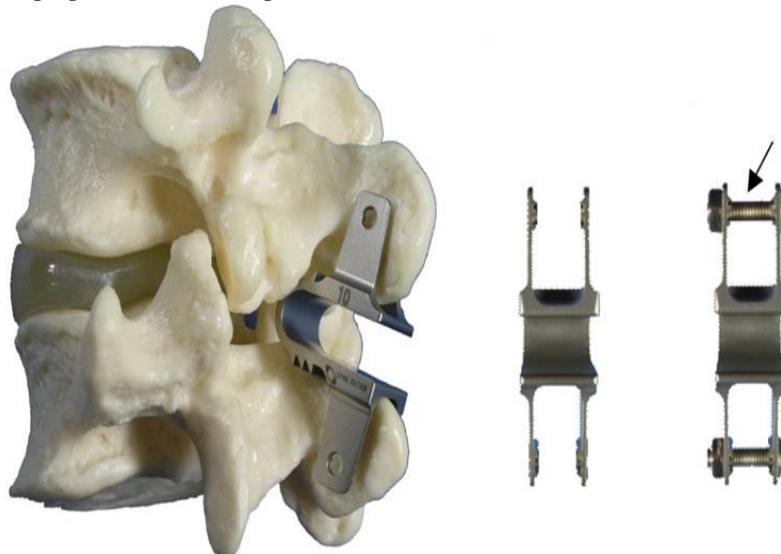


Figure 3: a. Spinal Vertebra Spacer



Figure 3: b. Spinal Vertebrae Spacer in the martensitic state (left) and in the original shape (right) [11].

ii. Cardiovascular

Simon filter is the most common application of SMAs in cardiovascular field. Simon filter was developed and introduced in cardiovascular application to help patients who can't take anticoagulant medications to prevent blood vessel interruption and pulmonary embolism. Therefore, the main function of Simon filter is to protect suggested patients from blood clots by filtration of

blood stream. Also, the insertion of Simon filter in patient's tissue is achieved by applying the shape memory feature from its original shape in martensitic phase as shown in figure 4, then the filter is deformed and placed at catheter tip to introduce inside patient's body. When the catheter releases the Simon filter, the temperature of blood stream stimulates the Simon filter to return to its original shape [12].

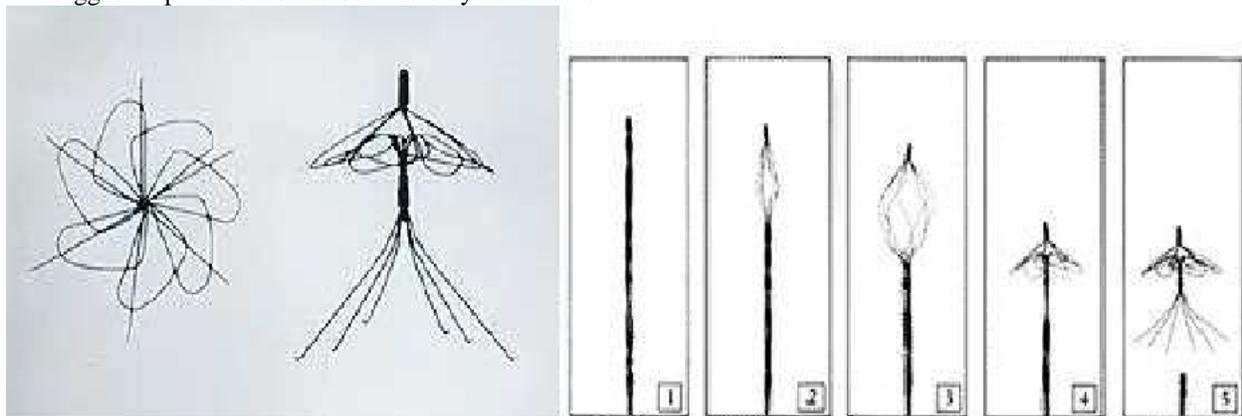


Figure 4: Simon Filter in recovery shape, Filter released from catheter

Another example of SMAs used in cardiovascular applications is atrial septal occlusion device which is particularly employ to seal atrial hole located between two upper chambers of heart. Catheter technique is used to introduce atrial septal device

into human body after that the catheter is released and the device return to its original shape to close the hole as shown in figure 5.

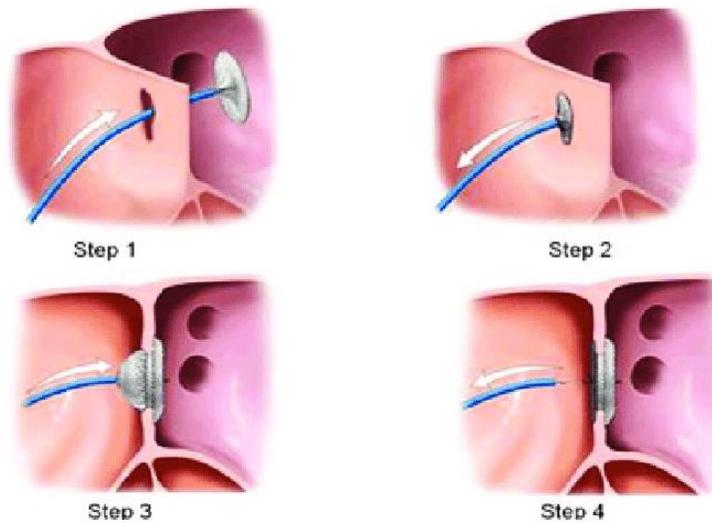


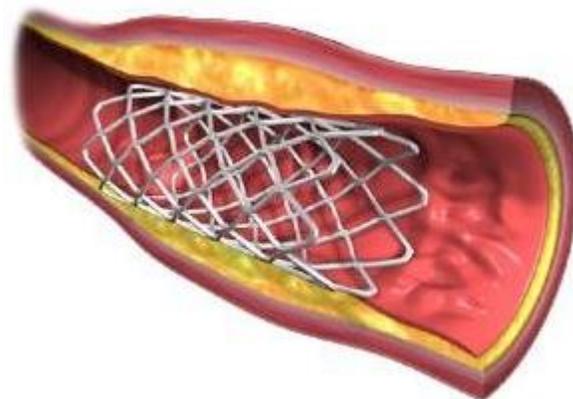
Figure 5: Installation of Atrial septal occlusion device

Furthermore, self-expanding cardiovascular stents are playing a significant role to maintain the correct inner diameter of blood vessel to ensure good oxygenation. Self-expanding stents are used widely in cardiovascular applications to support any tubular passage such as the esophagus and bile duct and blood vessels such as the coronary, iliac, carotid, aorta and femoral arteries [14]. Figure 6.a shows self-expanding stent as cylindrical



Figure 6: a. Self-expanding stent

scaffold with shape memory characteristics which is instated into human body by catheter technique. Firstly, the stent is compressed at the martensitic phase, then it is inserted into the correct position in cardiovascular system. When the SMAs stents is heated by blood and body temperature, it is started to return and recover the original shape and perform expanding process to prevent vessel obstruction or to support weak vessel [15].



b. Self-expanding stent after insertion

iii. Orthodontic

In 1975 the first application of SMAs was implemented by Iowa University by exploiting pseudoelastic feature of Ni-Ti wires used to fix orthodontics treatment with multibrackets at buccal cavity temperature in austenitic phase. Practically, deformation of wire during transformation stage from austenite to single-variant martensite. Pseudoelasticity effect is used to produce constant load after positioning the wire in brackets as

shown in figure 7.a. Also, SMAs wires may inserted into steel arches as shown in figure 7.b which is used to apply rotating, expanding or torque load on superior molars by pseudoelasticity effects. The main function is to solve the problem of teeth overcrowding by generation expanding tensile force constant in time, these forces produce stress conditions to improve tissues growth and movement of teeth to the correct positioning.

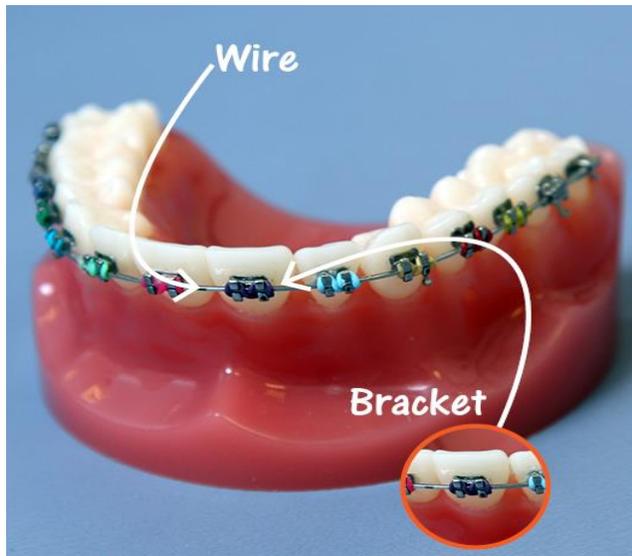


Figure 7: a. SMAs Orthodontic Wires



b. Palatal arch.

In addition to that, SMAs are used to repair broken bone in facial area such as nose, jaw or eye socket where casting not applicable to injured area. SMAs material are placed instead of fracture bone and fixed with screw to maintain the original shape and alignment of broken bone, as well as promote cells and tissues

generation. Regarding shape memory features, SMAs tends to return to the original shape and exerting constant force that play a vital role to rebuild separated parts of broken bones and stimulates the osteogenesis as shown in figure 8.



Figure 8: Matrix mandible SMAs

IV. CONCLUSION

Shape memory alloys (SMAs) are playing significant role in medical applications regarding to their unique features; shape memory effect and pseudoelastic effect. Leading to return to the original shape after large force of deformation which enable to maintain and support different type of human body structure

such as blood vessel and bones. Interestingly, body temperature stimulates crystallographic structure of SMAs to recover into the original shape during transformation and austenite phases. In addition to that, SMAs have special attractive properties that comply with medical applications such as good biocompatibility, high resistance to corrosion, magnetic resonance compatibility and low biotoxicity for biological tissues. All these unique properties attract scientists and manufacturers to invest in researches and

development to discover more applications in medical field for SMAs.

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India-South Korea Investment and Trade Relations

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DOI: 10.29322/IJSRP.10.09.2020.p10550

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10550>

Abstract: Over the years, the economic relations between India and Republic of Korea have grown rapidly. However, the size of trade and investment relations between the two countries is still comparatively low and gives a lot of space for the improvisation. In the above mentioned context, the following paper examine and explore the investment and trade relations, barriers to economic relations and potential areas of future cooperation. We also find that the improvement in political relations between two countries increase the trade and investment by imposing policies like CEPA, Korea Plus and many more. It also focuses on the scope available for India to increase its export to ROK. Lastly, we also observe how changing few restrictive foreign policies of both the countries will give a major boost to trade and investment relations.

Key words: India, Investment and Barriers Korea, Trade.

JEL Classifications: F 13, F 15, F 59

1. Introduction

In the recent years of the world economy Asia has emerged as a growth centre. After China and Japan, within the region India and Korea are considered to be third and fourth largest economies. South Korea has emerged as a key player of major trading and investment partner for India and China. In 1962 South Korea adopted outward-oriented policies with the beginning of first five-year economic development plan which helped in integration of Korean economy with the rest of the world. The consistent and high economic growth made South Korea one of the high-income economies in Asia. As compared to other developed countries Korea is still growing at a faster rate.

Since independence until the early 1990s India adopted import-substitution policy. India is moving towards a market-driven economy with wide range of economic policy reforms being introduced. India has experienced consistent high economic growth over the last one and half decades, making India 10th largest economy in the world. Currently, India is the second fastest growing economy in the world. Both India and Korea have enhanced their role in international economic order and have been getting integrated with the world economy.

In the last three and a half decades, there was a continuous strengthening of bilateral economic relations between the two

countries as there were high-level exchanges and signing of several crucial agreements

2. LITERATURE REVIEW

There have comprehensive empirical studies on India-Korea trade showing the impact of trade on economic growth.

Economic survey (2007-08) shows a significant feature in India's service sector emerged as a world leader in IT and BPO services. According to UNITED NATIONS COMTRADE database on international trade India's import from South Korea was amounted to USD 16.11 billion in 2019. In most the studies there is focused on the openness on the economic growth but through the comprehensive literature both dynamic and static gains could be collected. In December 2009, Working Paper NO. 242 titled India-Korea Trade and Investment Relations was made by Pravakhar Sahoo, Durgesh Kumar Rai and Rajiv Kumar. Since the economic relations between India and Korea has undergone tremendous modifications since 2009. Therefore, this is a very extensive topic which was chosen to bring into light the huge array of economic, trade and strategic issues between both the countries which have evolved over the years. However, given the size and structural complementarities of the two economies, the size of trade and investment which was considered low in 2009 can now said to be moderate.

3. Economic Profiles of India and Korea

3.1 INDIA

The Indian economy is characterised as a developing market economy as it is ranked world's fifth-largest economy by nominal GDP and third largest by purchasing power parity in the World GDP Ranking 2020. According to IMF, on per capita income basis, in 2018 India was ranked 139th by GDP (nominal) and 118th by GDP(PPP).

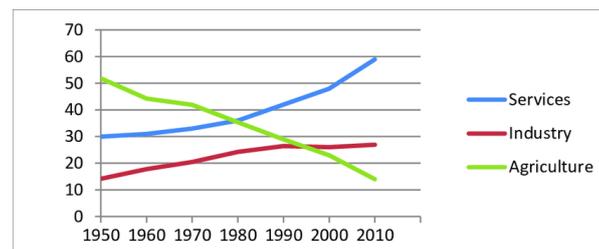
LPG Policy, 1991

The LPG policy focussed on ending the license-permit by reducing the government interference in the business, and hence increasing the economic growth through reforms. This policy discouraged public sector monopoly and helped paving a way for competition in the market. Thus, the policy made India open up a global economy.

The size of the economy can often give the first impression of the might of the country. GDP gives the total worth of goods and services produced within the country in a year. There has been an increase of 2216% of India's GDP as it was Rs.5,86,212 crores in 1991 whereas 25 years later it stands Rs. 1,35,76,088 crores. In dollar terms, India's GDP crossed \$2trillion mark in 2015-16. At present, India is ranked quite high in the world in terms of nominal GDP and is expected to be the second largest economy in the world by 2050. In 2015-16, India was considered the fastest growing major economy in the world with a growth rate of 7.6%. the following indicators helped make LPG policy a success: -

- **Foreign Direct Investment:** FDI was negligible before 1991. There was only \$74 million of foreign investment in the first year of reform. However, investments have steadily risen. As of 2016, the country has received total FDI of \$371 billion.
- **Foreign Exchange Reserves:** India was forced to bring economic reforms due to dismal state of forex reserves are at a high record. In 1991, it was just \$5.8 billion whereas at present the country's forex reserves are \$360.8 billion.
- **External Debt:** The country's external debt started expanding as companies started borrowing from the overseas market to fund their growth. In 1991, the country's external debt was \$83.8 billion while in 2015 it was \$480.2 billion.
- **Foreign Institutional Investment:** The FII inflows and outflows often reflects a country's economic and political stability. In 1992-93 FII inflow was just \$4.2 million. There was a spike of FII inflow from \$8.87 billion in 2013-14 to \$45.69 billion in 2014-15.
- **Per Capita Income:** Per capita income refers to the average income of every citizen estimated by dividing GDP to the country's population. Between 1991 to 2016, the per capita income increased from Rs. 6,270 to Rs. 93,293 which is a whopping 1388% jump.
- **Purchasing Power Parity:** It gives an idea about cost of living and standard of living in a particular country. The standard of living is improved for sure, when per capita income of Indians is calculated in terms of PPP. The per capita PPP increased nearly five-fold from \$1,173 in 1991 to \$5,701 in 2014. Whereas, when compared to other countries India's standard living and cost of living is quite low.
- **Share of agriculture, industry, and services in GDP:** The agriculture sector's contribution to the Indian economy has shown a gradual decrease in the post reform period i.e. it was 29% in 1991 whereas it is now only 15% of GDP. For propelling the economy at global stage, the services sector has taken lead role as it contributes 53% to the national economy. However, there has been only a marginal growth in the industrial sector.

GRAPH 3.1.1: Changes in Agriculture, Industry and Services Sector since LPG



- **Power Generation and Consumption:** As the country grows economically, the power consumption increases too because electricity consumption is proxy for growth. Cumulatively, there's been a 162% growth in power consumption between 1990-91 and 2012-13 from 291.8kWh to 765kWh.
- **Labour Force and Employment:** More or less two-fifth of the population is a part of labour force as it currently stands 49.7 crores compared to 33.7 crores in 1991. There has been a fall in the unemployment rate i.e. from 4.3% in 1991 to 3.6% in 2014. The sectorial contribution of labour has witnessed a notable change, as agriculture sector now employs less than 50% labour force whereas industrial and service sector are far ahead.

Trillion Dollar Club:

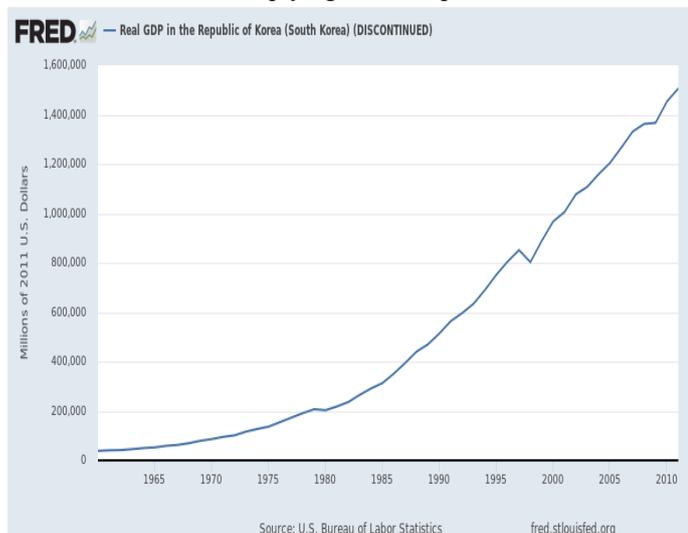
With a nominal GDP of \$2.94 trillion India is the fastest growing trillion-dollar economy in the world. In 2019, overtaking United Kingdom and France, India has become the fifth largest economy. India ranks third when GDP is compared in terms of PPP at \$11.33 trillion. According to IMF, India's growth rate is expected to rise from 7.3% in 2018 to 7.5% in 2019 as drags from currency exchange initiative and introduction of goods and services tax fade.

Imports and Exports of India Since 1991:

India's trade policy in terms of foreign trade has shown the following changes after the trade policy was executed in 1991:

- The import duties of India were 200% in 1991 which were highest in the world were brought down to 45% in 1997-98.
- There has been a nominal rise in share of manufacturing in India's export from 78% in 1992-93 to 84% to 2015-16.
- There has been a sharp change in composition of India's export basket as demand for chemical products and engineering goods is increased while share of textiles, leather and ready-made garments have fallen.
- After the discovery of oil and gas reserves, the share of petroleum and crude products increased from 2.57% in 1992-93 to 11.58% in 2015-16.

- According to the Economic Survey 2014-15, the domestic value addition to the overall merchandise exports has been falling from 85% in 1998-99 to 71% in 2007-08, implying more import content in India's



export basket.

GRAPH 3.1.2: Growth in High value Export Sectors (%)



3.2 SOUTH KOREA

South Korea has emerged as 20th century's one of the most remarkable economic success stories, becoming a developed, globally connected, high-technology society after emerging from per capita was comparable with the levels in the poorest countries in the world and on the other in 2014, South Korea's GDP surpassed one trillion Dollar.

- **The Beginning:** In 1960s the government encouraged saving and investment over consumption, promoted import of raw materials and technology, kept wages low and directed resources to export oriented industries that remain important to the economy till this day. Under these policies, growth surged and frequently reached double digits in 1960s and 1970s. Gradually growth moderated in 1990s as economy matured but remained strong enough to propel the political changes of 1980s and 1990s.
- **1997-98 Financial Crisis:** The South Korean companies were hit hard by the Asian financial crisis of 1997-98 because of their excessive reliance on short term borrowing and ultimately the GDP fell by 7% in 1998. To tackle the difficulty various economic

reforms were introduced such as restructuring some chaebols, opening more foreign investment and imports, increasing labour market flexibility. These steps lead to a relatively rapid economic recovery. It tried to expand its network of free trade agreements to help boost exports and since then had implemented 16 free trade agreements covering 58 countries, including China and United State that collectively covered more than three-quarters of global GDP.

- **Current Scenario:** At present, South Korea is known as an economic success story, as it rose from one of the poorest countries before 1960s to a developed country, with high level of income. The total South Korea's GDP was estimated to be approximately 1.7 trillion US dollars in 2019. South Korea is expected to be one of the core economies driving the next generation of economic growth, alongside the BRIC countries.

GRAPH 3.2.1: Real GDP in South Korea

- **Sectorial Distribution:** The service sector contributes 56% of South Korea's GDP, while 33% comes from the South Korea's industrial sector. The agriculture sector generates less than 2% of GDP. South Korea's service sector employed over 70% of South Korean workforce in 2018.
- **Workforce:** More than 51 million inhabitants of South Korea are employed and the unemployment rate is expected to remain under 4% through 2024. South Korea is experiencing the effects of aging labour force, with a decrease in population share of people entering the work force and simultaneous increase in number of those aged 65 years and above. Despite that country's economy has remained a powerhouse, growing around 2.5% from 2018 to 2019.
- **Pandemic Effects:** The GDP of South Korea fell by 3% YOY in June 2020 following a real growth rate of 1.4% in the previous quarter. Nominal GDP reached 399.4 USD billion in March 2020. Where the GDP deflator fell by 0.6% and gross saving rate was measured 32.9% in March 2020. Thus, South Korea fell into recession in the second quarter due to the coronavirus pandemic, which ranked its worst performance since 1998 when it faced Asian financial crisis.

4. TRADE POLICIES OF INDIA AND SOUTH KOREA

4.1 India

The department of business has the mandate to make India the most important player in the global trade and stand a role of leadership in international trade organization with India's growing economy. India's foreign trade policy (FTP) provides all the necessary framework for the policies and different strategies for promoting trade and exports. It is responsible for multilateral and bilateral commercial relations, export promotion, special economic zones and also for the development and regulation of some export oriented industries. The current trade policy focuses on enhancing its reach for greater share in the market and also to expand its product ranges.

There are lot of challenges faced by India in the trade policies, the economic slowdown, domestic preoccupations, increasing protectionism. In order to achieve policy objectives, the manufacturing sector should be prepared for opportunities in an evolving multilateral trade arena. The country's exports are likely to witness 10-12 percent yearly decline due to contraction in global markets on the ongoing fiscal resulted through COVID 19 pandemic. Federation of Indian export organization mentioned that although there is lot of information from exporters, demand in employment intensive sectors such as footwear, handicrafts and carpets is still a challenge for the trade.

India and WTO:

There are large number of agreements between India and WTO like GATS, SPS, TRIPS, TRIMS agreement on agriculture, agreement on subsidies and countervailing measures and agreement on textiles. India is also involved in different trade disputes with WTO. India's import duties for sectors like steel, electronic and iron as well as its subsidies for sectors like sugar, fisheries and solar panels have been challenged by different countries at the forum.

WTO NEGOTIATION:

- The Doha round of trade negotiation in WTO provides an opportunity to correct the contortion in the global trade and to enhance the rules to enable a greater participation of developing countries in the world trade.
- India plays a major part in the agriculture negotiation as large part of population is dependent on agriculture for its livelihood. Thus negotiation deals with safeguarding the interest of low income and resource poor agriculture producer, effective reduction in trade-distorting domestic support, elimination of all forms of exports subsidies and improvement in transparency.
- In this round it's important for India and other developing countries to protect the interest of vulnerable industries. The development interest of the industries cannot be ignored due to mercantilist considerations.

India's share in world exports and imports

At pre 1991 India was a closed economy with export value as US\$ 13.87 billion and import value of 19.35 billion in 1998, but in 1991 due to Liberalization, privatization and globalization there were various trade reforms adopted such as abolition of import licensing system, devaluation of domestic currency, reduction in import duties, removal of quantitative restriction on imports and reduction in tariff rates. This all lead to the enhancement of India's trade policies in global world.

GRAPH 4.1.1: India's share in world Exports or Imports



4.2 South Korea

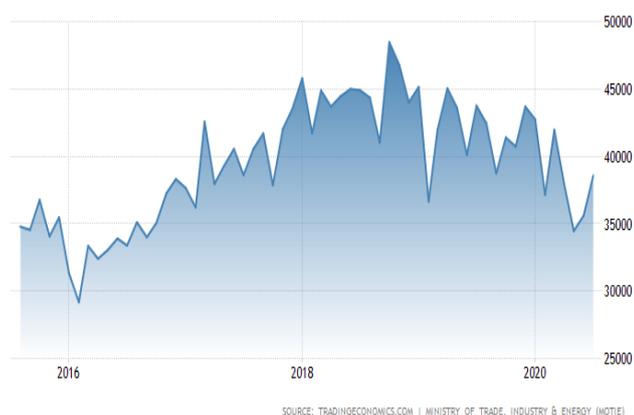
Korea is a native member of WTO; it receives a special treatment provided for in the WTO agreement. The structure of trade policies formulation, implementation and evaluation in Korea has remain unchanged since its previous trade policy in 2008. Korea has intensively pursued free-trade agreements with major trading partners that is (ASEAN, INDIA, PERU, THE EU, THE UNITED STATES). Measures have been strengthened to compensate domestic producers and companies which are injured due to FTA-induced import competition. Korea which is major donor to WTO trade related technical assistance has continued to provide duty free treatment to imports to least developed countries. Korea has taken steps for meeting its transparency obligation at the top level. Since decades Korea has used outward development strategies but these strategies have helped Korea to transform from a subsistence agrarian economy in 1960's into the 12th largest trading nation.

South Korea's share in world's imports and exports

South Korea is the eleventh largest importer in the world but the imports to South Korea has been declined by 11.9 percent yearly to USD 38.6 Billion in July 2020 due to coronavirus pandemic. According to Korean trade investment promotion agency (KOTRA) about 88% of Korean subsidiaries established in India are owned and 11.3% are the Joint ventures. These joint ventures are mainly with the Korean companies as with Indian companies its very rare. Korean enterprises including LG, Samsung and Hyundai motors have owned the subsidiaries with large scale investments which

helps them to create brand image, gain negotiating power with the government and operate on economies of scale. South Korea is currently ranked as the seventh largest export economy in the world and has a trade balance of \$93.7 billion. Its major exports are in silver, copper, zinc, refined petroleum and gold.

GRAPH 4.2.1: Korea's share in worlds imports



South Korean trade policy and FTA'S

In earlier decade during 1960's the Korean trade policy focused on export promotion, particularly in the areas of Labour and light industrial products such as textiles and footwear. In 1990 onwards Korean trade policy concerned about multilateral trade initiatives such as Uruguay Round and began to consider regional trade agreements (RTA'S) as a major trade policy instrument. Its interest would not be promoted by the membership in the RTA. Korea has also participated in the regional economic cooperation agreement such as APEC and also in preferential tariff arrangements in the developing countries such as Global system of trade preference. The Korean government now understands that free trade agreements (FTA'S), if properly managed with proper rules can supplement the multilateral trading system and contribute to market through bilateral and trade liberalisation.

- **Korea and Chile FTA:** Korean government decided to negotiate an FTA with Chile in November 1998. Chile had an extensive FTA network. The Korea-Chile FTA (KCFTA) covers the range of relations between the two countries in trade in goods, investments, services, and competition policies. In the KCFTA which was the first FTA concluded by Korea, liberalization in the agriculture sector became more difficult than the originally anticipated as there was limited trade in that sector. Similar difficulties are expected in Korea's future FTA'S with the agriculture sectors.

5. India-Korea Trade

5.1 Comprehensive economic partnership agreement (CEPA)

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CEPA was signed between Korea and India in Seoul on 7 August 2009 and it came into operation by 1st January 2010. CEPA is the first free trade agreement by Korea with the member of the BRICS nations. The trade deal that was finalized deals with the two countries in lowering the import tariffs on the wide range of the goods over several years and helps to increase the opportunity for trade in goods and services and for the investments. There was the negotiation that stated that India would cut tariffs on 85 percent on Korean exports and Korea was to reduce tariff on 90percent on Indian exports. For the purpose of reduction and elimination of tariffs CEPA has classified 11,200 tariff lines of Korea and 5,200 tariff lines of India into 6 categories. The categories include:

- Those which will eliminate the tariff completely on implementation of the agreement.
- Those which will have the annual tariff reduction of 20% or 12.5%.
- Those categories which deals with reduction in the final tariff to 1%-5% after 8 years.
- There is an exclusive category which will not enjoy any tariff reduction.

CEPA has allowed service market to be opened such as telecommunication, construction, distribution, accounting, building, real state, energy distribution, medical services etc. CEPA has helped in expansion of the job opportunity such as engineers, managing consultant and computer specialist. India agreed for 10 Korean banks to establish their branches in India. At present Woori bank has one branch and Shinhan bank has four branches, Hana bank, and KB bank has set up their respective branch offices. CEPA allows 163 Indian professionals such as engineers and computer programmers to have access to the Korean service market. The bilateral trade between India and Korea has increased in 2010 by 40% to over US\$17.57 billion. Korean export increased by 42.7% whereas the Indian export rose by 37% in 2010. There was joint committee that was set up by ministry of commerce and industry between India and Korea for the annual review of the implementation of the CEPA. The first meeting was held in New Delhi on 20th January 2011. It was further decided to merge the erstwhile joint trade committee established in 1987 into the joint committee under CEPA. The second meeting of joint committee at the director general level was held on 29 September 2011 in Seoul. When President of Korea visited India it was agreed to establish India-ROK joint trade and investment promotion committee to replace joint committee.

5.2 TRADE IN SERVICES

India has performed better than Korea in trade in services. But if we compare with the merchandise trade Korea is better than India. India's export of commercial services has been increased more than five times from \$16 billion in 2000 to \$89.7 billion in 2007. The export services of India in the commercial services has increased by more than 20 percent annually in the last consecutive five years. Though Korea has grown in its exports steadily after 2002 but on the other hand it still faces the fluctuations in the export of its services. The annual growth

of Korea's exports was higher in 2007 than in India. The overall value for the Korea's export of commercial services in 2000 was \$29.7 billion, which saw a consecutively decline in 2002 to \$27.3 billion but from that period the exports in the services have been rising and has reached to \$61.5 billion in 2007.

There has been lot of changes that India went through during these decades in its structure of service exports. These exports were largely dominated by travel and transport services before 1995 but the share of the travel and the transport services tend to decline. But the share of the other services has grown over that period. Those services which have grown during the past years are computer and information services, business services and insurance services. According to the economic survey conducted in 2007-08, a significant feature in the India's service sector emerged as world leader in IT and BPO services. India was accounted 46 percent of global market in BPO and 65 percent of global market in IT in 2004-05. There has been changes in the export structure of Korea since last 15 years which is different from the changes that took place around the world and in India. In Korea the transport services have increased at a faster rate than the other services.

If considered the bilateral trade in services between Korea and India there is lack of data but the trade in the services has been rapidly increasing between these two countries, especially in the IT, software and travel services. According to the Electronic and Computer software export council (ESC), the software exports from India to South Korea were \$27.53 million in 2001-02 compared to \$8.67 million in 2000-01. Korea can also be utilized to get a stronger presence in the APEC region.

5.3 Merchandise Trade between India & South Korea

After the liberalization of Indian economy in 1990s, India-Korea trade and economic relations grew continuously. The economic reforms in India were received positively by different institutions and companies in ROK which led to growth of bilateral trade between two countries from US \$ 1.5 Billion (1997-98) to US \$ 4.2 Billion (2004-05). The average annual growth rate of trade between the years 1997-98 to 2004-05 is 17%. The bilateral trade between the two countries have increased over the time but still remains small compared to the large potential of trade they have. Recently, India was ranked 11th among export destinations and 16th among sources of imports for the Korean Economy.

India's imports from Korea are identified by appropriately diversified goods comprising of manufactured goods such as electronic goods, machinery transport equipment, iron & steel and some organic chemicals. On the contrary, India's export basket solely revolves around primary products, raw materials and ores. These items are petroleum products, oil meals, oils and minerals, iron ores etc.

However, even after this there is a great scope of trade in agriculture and marine products, essential oils, auto components, defense related products, cosmetics industry

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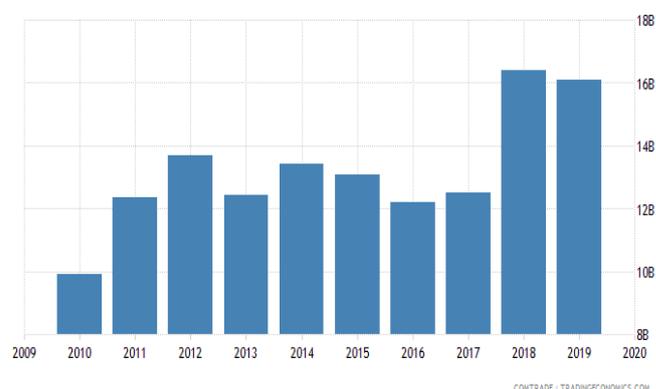
between the two nations. This we will discuss in great detail under the section of future cooperation.

Till now we have observed the pattern of trade of different merchandise and services between the two countries. We will now look towards the Import and export of goods and services between India and Korea through a statistical approach.

5.3.1 India's Imports from South-Korea

The Imports from ROK to India have been continuously increasing over the years. According to the United Nations COMTRADE database on International Trade, India's import from South Korea amounted to USD 16.11 Billion in the year 2019. The following graph shows the change and pattern of import from ROK for the past 10 years.

GRAPH 5.3.1.1: India imports from Republic of Korea



NOTE: The X-axis shows the years. Whereas the Y-axis represents the value of Import to India from Korea in US Dollars.

Next we are going to analyze the Imports of goods from different sectors in India. The succeeding table displays the monetary value of the different goods imported in the year 2019.

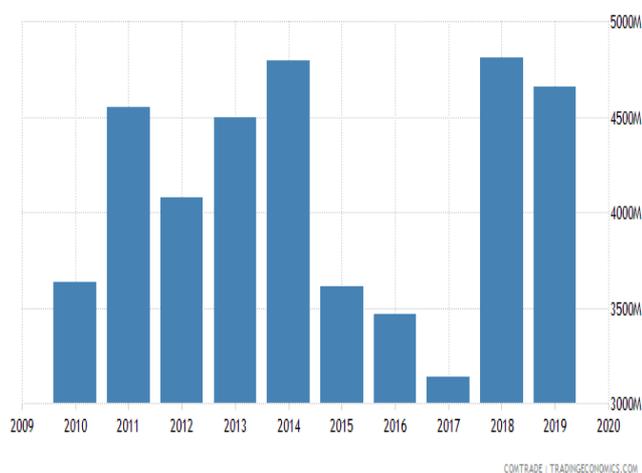
TABLE 5.3.1.1: Import of different Goods in 2019

India imports from South Korea	Value
Electronic equipment	\$2.93B
Iron and steel	\$2.51B
Machinery, nuclear reactors, boilers	\$2.30B
Plastics	\$1.67B
Organic chemicals	\$1.20B
Vehicles other than railway, tramway	\$893.59M
Mineral fuels, oils, distillation products	\$824.63M
Optical, photo, technical, medical apparatus	\$452.81M
Articles of iron or steel	\$355.22M
Zinc	\$288.27M

5.3.2. India’s Exports to South-Korea

South Korea is one of the best economies in the Asian region and thus, the imports from other Asian countries remains comparatively low. But still according to UN COMTRADE database India’s export to South Korea amounted to USD 4.65 Billion in 2019. The next graph observes India’s export to Korea over the years.

GRAPH 5.3.2.1: India Export to Republic of Korea



NOTE: The X-axis shows the years. Whereas the Y-axis represents the value of Import to India from Korea in US Dollars.

Subsequently we examine the value of different goods and services exported to Korea. During this observation it is noted that most of the goods that are exported are the natural resources that is greatly used in the industrialized countries.

TABLE 5.3.2.1: Export of different Goods in 2019

India exports from South Korea	Value
<u>Aluminium</u>	\$834.04M
<u>Mineral fuels, oils, distillation products</u>	\$793.13M
<u>Organic chemicals</u>	\$447.22M
<u>Iron and steel</u>	\$313.80M
<u>Machinery, nuclear reactors, boilers</u>	\$198.22M
<u>Cotton</u>	\$188.23M
<u>Electrical, electronic equipment</u>	\$175.14M
<u>Residues, wastes of food industry, animal fodder</u>	\$156.37M
<u>Ores slag and ash</u>	\$128.90M
<u>Lead</u>	\$123.01M

6.INDIA-KOREA INVESTMENT RELATIONS

6.1 Korean Investment in India

In the early 1990s, India adopted new economic reforms like LPG policy, which offered a conducive investment environment for potential investors from foreign land. Under this many Korean Companies also invested in Indian markets and within a short period of time established themselves greatly. Among the different companies that invested in India Hyundai Motor Group, Samsung Electronics and LG group have been leaders and became household names in the country. The investment from these companies come as:

1. **Hyundai Motors** has set up an automotive plant in Tamil Nadu with a capacity to produce more than 650,000 cars annually.

2. **Samsung Electronics** has two factories – one each in Noida and Sriperumbudur (TN) and five R&D Centres. Samsung announced \$780 million investment to expand their Noida facility for manufacturing smartphones and consumer electronics. This Noida facility is the world’s largest mobile manufacturing unit, doubling its current capacity of 68 million to 120 million mobile phone units by 2020.

3. **LG Electronics** operates two factories in India, one each in Noida and Pune, with an R&D Centre in Bangalore. **LG Group**, in a partnership with the Vedanta Group, is set to build India’s first LCD manufacturing unit in Maharashtra.

The year 2018 marked 45 years of successful diplomatic ties between the two countries. In 2018, Korea’s investment to India also crossed the \$1 billion mark for the first time, recording \$1.053 billion. Korean FDI to India (up to Sep 2019) stood at \$ 6.29 billion, as per the Export-Import bank of Korea, of which \$198 million was received in 2010, \$452 million in 2011, \$311 million in 2012, \$342 million in 2013, \$325 million in 2014, \$314 million in 2015, \$330 million in 2016 and \$514 million in 2017, \$1,053 million in 2018 and \$340 million in Jan-Sep 2019. The following table shows the Year Wise FDI Flow from South Korea to India over the years:

Table 6.1.1: Year-Wise FDI from South Korea (in US \$ Million)

YEAR	FDI from S. Korea (in US \$ Million)
2008-09	114.62
2009-10	166.9
2010-11	131.35
2011-12	244.78
2012-13	223.97
2013-14	173.82
2014-15	128.23

Source: DIPP

Recently, The Republic of Korea became the 13th largest FDI investor in India, investing \$ 4.5 Billion during April 2000 – March 2020. The major sectors that attract this FDI Inflows from South Korea to India are Metallurgical Industries, Food

Processing Industries, Transportation Industries, Industrial Machinery and Companies involving Electrical Equipment.

In recent years after India adopted outgoing foreign policies, interactions between South Korea and India have increased, which also turned out to be a boon for investment and commercial relations between the two countries. As a result, India-Korea collaborated and jointly launched an initiative 'KOREA PLUS' as proposed by Indian Prime Minister Narendra Modi in 2016.

Korea Plus: It mainly aim to promote Korean investment in India. It is established under Invest India Initiative, covers the entire spectrum for Korean enterprises looking to invest. It provides regular investment reports and information relating to various sectors. The regulatory framework for investment is also available on the platform for Korean investors to understand the market before investing. The Korea Trade-Investment Promotion Agency and Invest India work together to assist investors from Korea by providing services such as meeting facilities, public relations, research and evaluation.

The Indian Chamber of Commerce in Korea comprising Indian and Korean companies play a constructive role in

Foreign Direct Investment		2017	2018	2019
FDI Inward Flow (million USD)		17,913	12,183	10,566
FDI Stock (million USD)		229,399	237,238	238,553
Number of Greenfield Investments***		120	136	117
Value of Greenfield Investments (million USD)		5,234	8,539	3,608

promoting trade and investments linkages between the two countries and assist Embassy in organising seminars and events on business promotions. These efforts have proved to be great for investment relations between the two countries.

6.2 Indian Investment in Korea

In the early years of globalization, Republic of Korea was not very welcoming to attract foreign investments in the country. Between 1960s to 1990s the share of FDI inflows in its gross fixed capital formation and in its GDP have been very less compared to the rest of world and emerging economies.

However, soon after the importance of foreign investment was realised in Korea and the policy makers enacted a new investment promotion act in 1998. It was aimed to provide foreign investors easy incentives from tax incentives to cash grants for R&D projects. Other than this Korea also created new investments such as Invest KOREA and the Office of the foreign Investment Ombudsman to facilitate Foreign Investment in the country.

Owing to such projects the Investments from India to Korea have increased substantially over the years. Investments from India to Korea are to the tune of approx. \$3 billion led by Tata Daewoo, SsangYong and Novelis. Major investments from India come from the following institutions:

1. Novelis Korea Limited by Aditya Birla Group (2005)

Novelis Inc. holds 68% of share that total amounts to about US \$600 million in Novelis Korea Ltd. Its total investment in Korea accounts to more than \$700 Million.

2. TATA-Daewoo Motors by TATA Group (2004)

It took over Daewoo Commercial Vehicle (Gunsan, Korea) for approximately \$102 million in 2004. Today, collective investment from Tata Group in Korea sums up to \$ 400 Million.

3. Mahindra SsangYong Motors (2010)

In 2010 Mahindra & Mahindra group acquired a majority stake in SsangYong Motors with investment worth of \$360 Million. Now the total investment from this company in Korea accounts to \$1.5 billion.

4. Nakhoda Ltd.

It is one of the largest yarn producers in India and later obtained the Korean Kyunghan Industry with investment of approximately \$ 40 million.

After realising the importance of foreign investment ROK worked on its image and appealed to foreign investors on the basis of rapid economic development and country's specialization in modern communication and information technologies. Thus, World Bank promoted ROK to 5th position on Ease of doing Business list 2020.

Table 6.2.1: FDI in Republic of Korea (in US \$ Million)

Source: UNCTAD, Latest available data.

Note: *** Green Field Investments Are a Form of Foreign Direct Investment Where a Parent Company Starts a New Venture in a Foreign Country by Constructing New Operational Facilities from the Ground Up.

6.3 Technical Collaboration

Technological collaboration between two countries in world has been a major source of technology acquisition for companies in developing countries. In case of ROK and India the technological collaboration achieved a major spike in recent years.

The Department of Defence Production, Ministry of Defence of India and Ministry of Defence Acquisition Program Administration of ROK signed an Inter-Governmental MOU on April, 2017 that aims at partnership in naval ship buildings between the two countries.

Under the 'Make in India' Program, State-owned Hindustan shipyard Ltd. (HSL) will be collaborating with Hyundai Heavy Industries Co. Ltd. Of South Korea for the production of Defence gadgets. Furthermore, an alliance between M/s Hanwha Techwin of ROK and L&T of India will lead to production of 100 tracked self-propelled 155mm/52 calibre artillery guns "K-9 Vajra" for Indian armed forces.

The continuous efforts made by both the countries will lead to better path of investment and trade relations.

7. TRADE AND INVESTMENT BARRIERS

We have analyzed till now that both the countries are working on improving its trade and investment relations. Although both trade and investment between India and Korea have increased over the years but still remains low compared to its potential. Apart from natural barriers like distance, there are some created barriers in both countries limiting the goods and services trade as well as investment.

7.1 Barriers in India

India has always considered the importance of trade relations and try to pursue outgoing policies in order to create long lasting relations with countries all across the world. However, India's trade arrangement and regulatory environment remains limiting.

Tariff Barriers remains one of the biggest trade barriers in India as it charges high prices on imports of foreign goods. However, there are many non-tariff barriers as well that need to be discussed and resolved. Following are the non-tariff barriers restricting countries to trade with India:

- **Import Licensing**
Through the import licensing requirements, the Government of India restricts or prohibits the import of many goods. Most of the consumer goods are exempted from import licensing i.e. institutions need import license from GOI to import goods other than consumer goods.
- **Entry Requirements**
Considering the entry requirements, India divides the goods as new, secondhand, remanufactured or refurbished. The country allows the import of secondhand capital goods by the end user without the license. However, few of the problems that the other stakeholder's go through are the unnecessary details needed in license application, quantity limitation and lastly the long delays between the application and grant of license.
- **Service Barriers**
India impose restrictions on the following services: Insurance, Banking, Securities, Architecture, Telecommunication, Construction, Engineering and many more. The Indian Government owns a major part in the service sectors like banking and insurance. Foreign participation in professional

services has also been restricted, and in the case of legal services, it is prohibited entirely.

- **Other Barriers**

The imposition of trade-related investment measures and equity restrictions by the government result in unfair advantage to domestic institutions. The Indian Government also restricts the Foreign Direct Investment in sectors like retail etc.

7.2 Barriers in South Korea

We will first look in to the barriers pertaining in South Korea due to its regional, cultural or geographical appearances. Following are the weak points of the ROK due to which countries around the world resist investing in Korea:

- Regulatory Frameworks are quite restrictive and opaque which make it tough for foreign institutions to operate there.
- Dominance of big industrial groups i.e. Chaebols which gives very less space for anyone else to flourish independently.
- The manpower cost is quite expensive compared to other countries.
- The population proportion of old people is much more that makes the work a little less productive.
- Property is extremely expensive and this cost companies quite a lot to set up their permanent offices in Korea.
- The country is extremely dependent on imports of raw materials which makes it tougher for companies to work efficiently without outward dependence.
- High Unemployment rate among the youth.
- Lastly, the continuing regional tensions with North Korea leads to turbulences in social-economic forum.

Also, foreign investors sometimes complain about the opacity of decision making and the existence of "informal desks", although progress is being made in this domain. Thus, beginning 2016, a reform of the financial system was imposed by lawmakers to formulate all the directives in a written form. They cannot pass regulations by acclimation anymore. The government also authorised foreign investors to create co-enterprises on South Korean territory through the promulgation of the Foreign Legal Consultant Act (FLCA). Finally, in 2016, an amendment was passed that should remove the barriers to FDI in air transport.

Republic of Korea tries to maintain some basic standards of technical regulations and conformity assessment procedures that are too tiresome. Few barriers also restrict the export of food items that are of real interest to India.

The Korean Pharmaceutical Trade Association (KPTA) critically review all the imported cosmetics in the Korean market. It delays the entry of product in domestic market.

Foreign companies go through a number of trade barriers while exporting services to ROK. A relatively high threshold level is

imposed for acquirement of construction services by government enterprises. It maintains huge number of restrictions on Film and Broadcasting industries as well.

Talking about the telecommunication sector where India would be extremely interested to collaborate. Korea imposes restrictions on foreign services providers that makes it tougher for institutions. It also prohibits from foreign satellite service providers to sell their services in Korea to end users.

Few other barriers that make foreign institutions take a back step from setting investment and trading relations with South Korea market include government assistance to few domestic industries, weak legal regime to protect intellectual property, lack of data protection etc.

8. Areas of Future Co-operation

There are complementarities in economic structures and future outlook between India and South Korea. The future agreements between the two countries should not only emphasize on increasing investment flows and trade by removing the existing barriers on both sides but should also focus on technical collaboration and co-operation in various sectors with high trade complementarity and both government and private initiatives should be promoted. The following areas can be considered for future co-operation between the two countries:

- **Co-operation in IT Sector:** The electronic and hardware industry of Korea is well recognised worldwide. The Indian software industry is considered to be most competitive in the world market and has proved to be mettle. So, in both the countries there is complementarity and scope for future co-operation. There is a scope to achieve joint leadership in this sector if both the countries combined their efforts and come together. There is a great possibility of success in embedded technology as it involves hardware and software. There is a great scope of outsourcing IT products and services since the cost of production and competition of Korean companies has been increasing and for outsourcing services, India is an attractive destination. IT education and training are another area of cooperation. Manufacturing, product development marketing is Korea's strength while world class training institutions are India's strength. If these are combined, then it would prove to be beneficial for both countries.
- **Co-operation in Science and Technology:** Science and technology is an area which both countries are already co-operating as India has financial resources and India is rich in science and technology personnel. It is imperative intensify co-operation between various institutions based in two countries for which India-Korea joint committee on S&T in 2005.
- **Co-operation in Pharmaceutical Industry:** Indian pharmaceutical industry from being a major importer of pharmaceutical products, has today become a net exporter of these products. Export destinations of

India not only include Asia and Africa but also has developed countries such as US, Canada and European countries. This proves the competitiveness and overall strength of the pharma industry. Both R&D facilities and human capital to leverage are there in India. Now as South Korea is emphasising on R&D in pharmaceutical-related areas, so there are high chances of co-operation between the two countries in areas such as vaccines, biotech goods, traditional medical products, clinical trials etc.

- **Co-operation in Broadcasting:** There are high chances of co-operation between the two countries in broadcasting as it is a growing industry in both the countries and since there are complementarities in the industry. India is well recognised for its content amongst the Asian countries. On the other hand, Korea specialises in dramas, mobile and digital broadcasting technologies. Hence, to initiate co-operation in the broadcasting industry would be in the interest of both countries.

9. Conclusion

The current size of trade and investment between India and Korea is very low according to the structure of these two economies. In this context the paper shows the analysis of the trade and investment relations between these two countries and their areas for future cooperation. India's exports constitute of low value-added and industrial products whereas Korea constitute of large value-added products. The analysis at the aggregated and disaggregated level shows that there are various products in which Korea is specializing which are competitive as India's exports are getting expanded. However, India shows decline in the comparative advantage in textile, cotton, rice and other primary products. There is increase in the merchandise trade mainly due to the demand structure in the complementary sectors.

Bilateral economic relations between India and Korea has been strengthen since 1991. Though the foreign investments have increased, Korea's share to FDI inflow to India has declined. Korea's investments are only to some sectors like electrical equipment and metallurgical industries. Since India basically focuses on the development of infrastructure which requires both huge investment and advanced technology thus it provides major scope for Korean companies to collaborate in the infrastructure sectors. Therefore, there is wider scope for these two countries to increase the trade in services.

Further, the trade complementarity index (TCI) shows that Indian and Korean trade has become more compatible, thus CEPA provides provision to reduce tariffs and non-tariff barriers on large number of products which would enhance the competition of exports in each other's markets. The agreement which proposes bilateral economic co-operation will strengthen the economies of both the countries.

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The Level of Environmental Disclosures in Annual Reports and Firm -specific attributes of Sri Lankan Listed Companies.

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DOI: 10.29322/IJSRP.10.09.2020.p10551

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10551>

Abstract

Since this is an era of environmental degradation in the wake of continually depleting ozone layer, climate change & global warming, environment consciousness in entities' activities has risen in recent years promoting the need for the environmental communication. Thus environmental disclosures entails informing the public on how successful a firm is in minimizing its negative impacts on the environment. The purpose of this study is to examine the association between firm specific attributes & environmental disclosures & environmental disclosure practices of Sri Lankan listed companies. These objectives are addressed through investigating the compliance with environmental aspects of GRI G.4.0 guidelines employing content analysis in the annual reports of 254 companies covering 20 sectors for the year 2018. Moreover, association between firm specific attributes & environmental disclosure level are analysed through Ordinary Least Square regression model. The study found that overall level of environmental disclosures is at a lower level in Sri Lankan listed firms. Also of the 20 sectors analysed, plantation sector depicts the highest level (19%) while Investment trust sector depicts the lowest environmental disclosure level (1%). Further, regression results imply that size & ISO 14001 were found to be as significant in determining the level of environmental disclosures while there were no any significant association between shareholder power, creditor power, financial performance, firm age & environmental disclosure level. The study will adds value to the existing body of literature on environmental disclosures, regulators, policymakers & stakeholders who are highly involved in, interested in & affected by the environmental disclosures.

Keywords: *Environment Disclosure, Firm – Specific attribute, Listed Companies*

Introduction

Sri Lanka is an emerging country, which is progressing to build up a “Blue Green Era” by streamlining the communication network and empowering the public on the importance of conserving and protecting environment. This was initiated with the aim of developing the Sri Lankan economy in making a clean and green environment. Transparency and disclosure represent one of the pillars of corporate governance. Disclosures are considered to be a strategic tool for a firm as a result of financial scandals happened due to the lack of improper corporate disclosures. As suggested by Owusu-Ansah (1998) disclosures are the communication of information, whether financial or non-financial quantitative or otherwise concerning a company's financial position and performance. Hence with the increasing demand of stakeholders and due to various environmental catastrophes financial reporting expanded its limited scope into incorporating of environmental information on a voluntary and mandatory basis.

This study typically attempts to bridge the existing gap between stakeholder's interest on information and the extent of disclosures in annual reports in CSE listed companies in Sri Lanka. As majority of the studies of the recent Sri Lankan studies focused on the Manufacturing sector in Sri Lanka (e.g., Aruppala & 5 Perera, 2013; Jariya, 2015; Sameera & Weerathunga, 2013) this study attempts to investigate the extent and determinants of environmental disclosures with reference to all the sectors in Colombo Stock Exchange to give a much broader view for the decision makers considering the relative significance of capital markets in national economies and the active role of individual investors in those markets. Moreover international studies (e.g., Kent & Chan, 2003; Pervan & Visic, 2012; Razeed, 2010) have focused on the theories that drive the environmental disclosures but few Sri Lankan studies (e.g., Jariya, 2015; Rajapakse, 2003) have given their priority in their studies to explain the environmental disclosure practices incorporating theoretical perspectives. In vein this study specifically concentrates on legitimacy theory and stakeholder theory as the need of a body of literature with proper theoretical foundation remains vacant unto some extent. Accordingly to address the theoretical and

methodological gap in the existing body of environmental disclosure literature in Sri Lankan context, this study attempts to investigate the level of environmental disclosures and the association between firm specific attributes and the level of environmental disclosures in annual reports of Sri Lankan listed companies.

Primary Question

Is there any significant association between the extent of environmental disclosure and firm-specific attributes in CSE listed companies?

Primary Objective

To investigate whether there is any significant association between the extent of environmental disclosure and firm-specific attributes in CSE listed companies.

Literature Review

Manager's perceptions regarding stakeholders' value and purpose of response relate to companies' environmental disclosure has been investigated by Rajeshwaran and Ranjani (2014) using 99 companies for the year 2013. Questionnaire has been addressed to the executives responsible for the environmental management and reporting and 84% of responses from these managers were then being contrasted with the quality of environment disclosures, measured by GRI guidelines. Descriptive statistics, correlation and regression analysis were employed to analyze the data. Results show that there is a moderate association between manager's perception on various stakeholders and purpose of responses. Further results indicate that core purpose of disclosing environmental information by companies is maintaining legitimacy.

Jariya (2015) investigated the level and determinants of environmental disclosures in annual reports of 30 listed manufacturing companies for the year 2012/13. The level of disclosure is measured by a checklist of 18 items of information. Content analysis and statistical analysis, correlation analysis, multiple regression and descriptive statistics analysis were used to analyze the data for the study. Results indicate that 50.63% of the companies provided corporate environmental information in their annual reports. Of the determinants selected firm size is positively associated with the level of environmental disclosure and profitability and listing age has not been significantly influencing factors for environmental disclosure.

Another study by Jariya (2015) has been conducted in order to examine the extent and content of environmental information disclosure provided in the annual reports of companies listed on Colombo Stock Exchange (CSE) in Sri Lanka with the aim of testing whether the size of the company determines the level of disclosure of environmental information with a sample of 60 listed companies in 17 different sectors for the year 2011/12 employing the content analysis. Findings of the study reveal that 41 companies (62.29%) provided environmental information in their annual reports and the level of disclosure varies across the industries. It is identified that the highest level of environmental disclosure items are reported under the sustainability reporting. Also findings show that maximum disclosures across all the industries can be seen for the theme "Green product" while the lowest disclosed theme is "Spills". Further it is indicated from the study findings that the relationship between amount of environmental disclosure and the size of the firms are significantly negative.

Extent and determinants of social and environmental disclosures of Sri Lankan listed companies are examined by Sujenthini and Rajeshwaran (2016) by selecting 100 companies representing 20 different sectors. A checklist based on Global Reporting Initiative (GRI) guideline (version 3) has been developed to score data in to the study. Data was analyzed using descriptive statistics and bi-variant test. Results indicate that there exists a low social and environmental disclosures practice in Sri Lankan listed companies. And further correlation results indicate that age of the firm is negatively correlated with social and environmental disclosure. Firm size, profitability and leverage are being positively related with social and environmental disclosures. As per the studies in the Sri Lankan context also has provided mixed results regarding the factors affecting the environmental disclosures in annual reports.

Methodology

Population

Population under consideration of this study is all quoted companies representing 20 business sectors in Colombo Stock Exchange (CSE). Currently 296 companies are listed in the Colombo Stock Exchange (CSE). All companies in Colombo Stock Exchange (CSE) were selected for the purpose of this research due to the lack of attention on all sectors regarding the environmental disclosures of annual reports in Sri Lanka and majority of the studies (e.g., Aruppala and Perera, 2013; Jariya, 2015; Sameera & Weerathunga, 2013) were confined only on examining the environmental disclosure on of manufacturing sector companies in Sri Lanka. Hence it emphasized the need for a broader view on environmental disclosure which is able to generalize the findings to all companies to assist decision makers.

Sample and Sampling Technique

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10551>

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Sample of this study consists of 254 firms representing each 20 sectors for the period of 2017/2018. Sample represents about 88% of the population under consideration. The overall study is based on 254 observations. Sample is determined based on the convenient sampling technique which relies on the collection of data from the population which are conveniently, readily available for the researcher to reach. This sampling technique has also been adopted by prior researchers (e.g., Jariya, 2015) for the purpose of selecting sample in their study.

Data collection method

Data were collected mainly through the secondary data sources in which researcher widely utilized the company annual reports in collecting data on the disclosures of environmental aspects by companies for the year 2017/2018 representing the latest annual report data to make the study more contemporary and up to date. Annual reports have been widely used in the analysis of corporate social reporting analysis by various authors for their credibility (Jariya, 2015). Further details were obtained from company websites and Colombo Stock Exchange website.

Results and Finding

Table 01: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.426 ^a	.182	.162	.16823	1.778

Source: Survey Data (2019)

Table 02: ANOVA Test

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.552	6	.259	9.138	.000 ^b
	Residual	6.990	247	.028		
	Total	8.542	253			

Table 03: Regression Coefficients

Model		Unstandardized Coefficients		t	Sig.
		B	Std. Error		
1	(Constant)	-.314	.116	-2.701	.007
	SP	.000	.001	-.563	.574
	CP	.000	.000	.736	.462
	ROA	.000	.000	-.146	.884
	AGE	.000	.000	-.792	.429
	SIZE	.028	.007	4.002	.000
	ISO	.133	.033	3.987	.000

Table 05: Summary of results of hypothesis

Hypothesis	Statistical Tool	Validation
Ha ₁ : There is a significant association between shareholders' power and extent of environmental disclosures.	Regression analysis	Reject
Ha ₂ : There is a significant association between creditors' power and extent of environmental disclosures.	Regression analysis	Reject

Ha ₃ : There is a significant association between firm financial performance and extent of environmental disclosures.	Regression analysis	Reject
Ha ₄ : There is a significant association between firm age and extent of environmental disclosures.	Regression analysis	Reject
Ha ₅ : There is a significant association between firm size and extent of environmental disclosures.	Regression analysis	Accept
Ha ₆ : There is a significant association between ISO 14001 certification and extent of environmental disclosures.	Regression analysis	Accept

Source: Survey Data (2019)

Conclusions

In an area of where environmental concerns is highly debated this study aims to investigate the association between firm specific attributes & environmental disclosure level & environmental disclosure practices of 254 sample companies across 20 sectors listed in the CSE for the year 2018. Firm specific attributes considered in this study are shareholder power, creditor power, financial performance, firm age, and firm size & ISO 14001 certification. Researcher found that shareholder power, creditor power, financial performance, firm age are not significantly associated with environmental disclosure level where Ha₁, Ha₂, Ha₃, Ha₄ are rejected accordingly. However firm size & ISO 14001 certification were found as significant firm specific attributes in determining the level of environmental disclosures of listed firms & they are positively associated with environmental disclosure level. Hence Ha₅ & Ha₆ are accepted accordingly. Furthermore researcher found that highest level of compliance with environmental aspects of GRI guidelines has been recorded by the Plantation sector companies while Investment Trust companies recorded the lowest level of compliance with GRI guidelines. Overall, researcher conclude that the level of environmental disclosure of firms in Sri Lanka in accordance with environmental aspects of GRI guidelines is at a very lower level in year 2018.

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Addition Of Flax Seed Oil (*Linum usitatissimum*) As A Source Of Omega-3 In Snakehead Fish (*Channa striata*) Albumin Ointment On Closure Of Wound Healing

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DOI: 10.29322/IJSRP.10.09.2020.p10552
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10552>

Abstract- Ointment is a semi-solid preparation intended for topical application to the skin or mucous membranes. Usually snakehead fish albumin is consumed in extract form so that people do not like it because of its smell. One alternative to using albumin, which is easy to apply to help the wound closure process, is to use it as an ointment. The advantages of the ointment are good for the drug delivery system, pleasant in appearance and comfortable feeling after use. The results of stage 1 research showed that differences in the concentration of flaxseed oil affected the quality of albumin ointment, that is pH, viscosity, omega-3, protein content, fat content, water content, fatty acid profile, and zinc. The best quality of albumin ointment was obtained at a flaxseed oil is 2.5% with the following results pH 6.7, viscosity 18,960 cP, omega 3 at 18.43%, protein content 1.94%, fat content 74.86%, and 10.98% water content. Then proceed to animal trials of mice on the 3rd, 5th, and 7th day of the observation showing that the best snakehead fish albumin ointment treatment experienced the fastest wound closure process with a wound closure character of 75% on the 7th day.

Index Terms- ointment, albumin, wound closure, fatty acid

I. INTRODUCTION

Snakehead fish is rich in nutrients needed by the body, especially protein. Albumin is a globular protein that is often applied clinically for nutritional improvement and postoperative wound closure. Albumin functions to regulate the osmotic pressure in the blood, maintain the presence of water in the blood plasma so that it can maintain blood volume in the body and also as a means of transport or transportation (Firlianty et al., 2019). Apart from albumin, an important component in the wound closure process is also influenced by collagen, omega-3 and omega-6 fatty acids (Nicodemus et al., 2014). The collagen used is collagen from grouper skin because grouper fish has the best collagen content (Suprayitno, 2019). Flaxseed oil is a source of omega-3 which has a high α -linolenic acid level of 57%. A-linolenic acid is a polyunsaturated fatty acid that cannot be synthesized by humans (Putri and Ardriara, 2016). The source of omega 6 fatty acid is obtained from sunflower seed oil.

Usually snakehead fish albumin is consumed in extract form so that most people do not like it because of its smell. One alternative to using albumin, which is easy to apply to help the wound closure process, is to use it as an ointment. Ointments are semi-solid preparations intended for topical application to the skin or mucous membranes (Yamlean et al., 2019). The advantages of ointment are good for the drug delivery system, pleasant in appearance and comfortable feeling after use (Tungadi et al., 2011). This study was used to develop an albumin extract with the addition of collagen, a fatty acid from essential oils containing omega 3 and omega 6 to form an ointment so that people can easily apply it to cuts.

II. MATERIALS AND METHODS

2.1 Materials

The research materials that used consist of raw materials for making albumin extract, that is snakehead fish, materials for the manufacture of collagen, namely grouper fish skin, NaOH, acetic acid and distilled water. The ingredients for making albumin ointment are albumin extract from snakehead fish extraction, flaxseed oil as a source of omega 3, collagen, sunflower oil as a source

of omega 6, and fillers in the form of adeps lanae, vaseline flavum, butylated hydroxytoluene (BHT) propylene glycol (PG) , methyl paraben and propyl paraben.

This research method is an experimental method carried out in 2 stages, stage 1 and stage 2. Phase 1 research aims to obtain the optimal concentration of flaxseed oil added to the production of albumin ointment in order to have the best ointment quality for research in stage 2. While the second stage study aims to determine the wound closure process in experimental animals using the best quality albumin ointment compared to positive control and negative control.

Research 1 aims to obtain the optimal concentration of flaxseed oil added to the production of albumin ointment in order to obtain the best ointment quality for the second stage study. While the second stage study aims to determine the wound closure process in experimental animals using the best quality albumin ointment compared to positive control and negative control.

2.1.1 Albumin Extraction

The production of albumin extract begins with the preparation of raw materials. The fresh snakehead fish is turned off and weeded, then filled, cut into cubes and then washed. Furthermore, the snakehead fish is weighed 250 grams, then put into the steamer pan. The snakehead fish meat is steamed for 30 minutes at 70oC. After that it is filtered and the filtrate is taken. Snakehead fish extract is ready to use.

2.1.2 Collagen Manufacture

The first step to make collagen is to prepare the raw material, namely the skin of the grouper fish which has been removed from the scales. Furthermore, the skin of the grouper is cut into 1 x 1 cm size. After that the grouper skin was soaked in 0.1 M NaOH for 24 hours. The ratio of skin and NaOH solution is 1:10. Then the grouper skin was neutralized with distilled water. After that the grouper skin was soaked in acetic acid for 24 hours with a ratio of skin and a solution of 1:10. Then filtered and taken the filtrate. After that, the precipitation was carried out for 24 hours with 0.9 M NaCl. Then it was centrifuged for 20 minutes at a speed of 3500 rpm. Then dialysis with 0.5 M acetic acid with a ratio of 1:10. Then inserted into the cellophane membrane. Then soaked in 0.1 M acetic acid solution for 6 hours. After that it is soaked in distilled water to neutral pH. Grouper skin collagen is ready to use.

2.1.3 Albumin Ointment Making

The process of making albumin ointment begins with preparing 3 beaker glasses. In the first beaker glass, put BHT and then crush it finely. Furthermore, the albumin extract is added. Then add a little adeps lanae and stir until homogeneous. In the second glass case, methyl paraben and propyl paraben were dissolved with propylenglycol. Then add a little adeps lanae and stir until homogeneous. In the third beaker glass, the two ingredients of the first beaker glass are mixed. After that, flaxseed oil was added with the respective concentrations of 0.5%, 1.5% and 2.5%. Then added collagen and sunflower seed oil. Then added to 20 grams of vaseline flavum. Albumin ointment was analyzed physically (pH and viscosity), chemistry (protein, fat, and water), and organoleptic.

III. RESULT AND DISCUSSION

3.1 pH

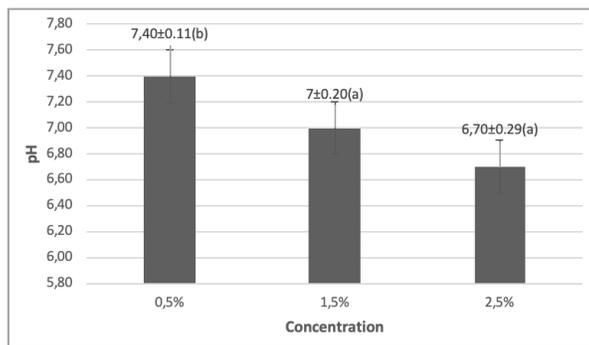


Figure 1. The Result of pH

The pH of the albumin ointment with different concentrations of flaxseed oil resulted in different pH values. At a concentration of 0.5% flaxseed oil, the resulting pH value was 7.4%, a concentration of 1.5% was 7, and a concentration of 2.5% flaxseed oil obtained a pH of 6.7. The highest pH value was obtained from the concentration of flaxseed oil 0.5% with a pH value of 7.4, and the lowest was obtained from a 2.5% flaxseed oil concentration of 6.7. Topical preparations are expected to have a pH that is at normal skin pH, namely 4.5 to 7 because if the pH is too alkaline it will result in scaly skin, whereas if the skin is too acidic it can trigger skin irritation (Patimasari et al., 2015).

3.2 Viscosity

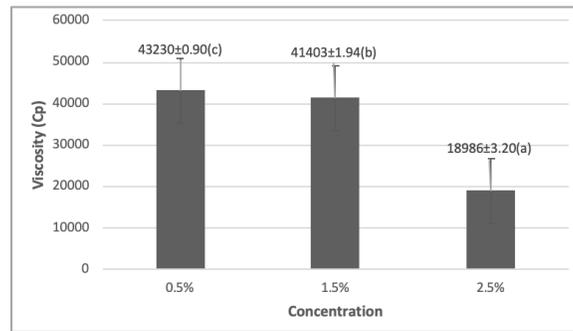


Figure 2. The Result of Viscosity

The viscosity value at 0.5% flaxseed oil concentration obtained a viscosity value of 43230 cP, a concentration of 1.5% of 41403 cP and a concentration of 2.5% of 18986 cP. The result of the viscosity of the ointment that had the highest value was albumin ointment with a flaxseed oil concentration of 0.5% as much as 43230 cP, and the lowest yield was at a concentration of 2.5% of 18986. Musdalipah, 2018).

3.3 Omega-3 Content

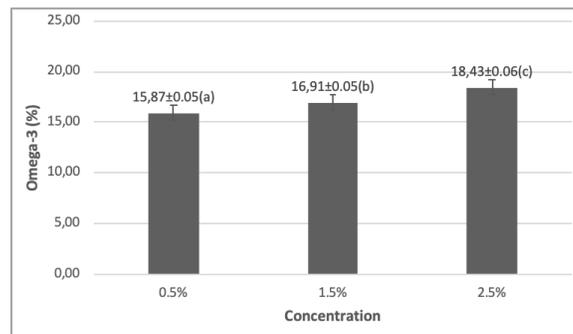


Figure 3. The Result of Albumin Content

The omega-3 content at the flaxseed oil concentration of 0.5% was 15.87%, the 1.5% concentration was 16.91%, and the omega-3 content of the flaxseed oil concentration 2.5% was 18.43%. The highest omega-3 levels were shown at a concentration of 2.5%, namely 18.430%, while the lowest levels of albumin were at a concentration of 0.5% at 15.87%. Omega-3 levels in the resulting albumin ointment showed an increase in line with the increasing concentration of flaxseed oil given.

3.4 Protein Content

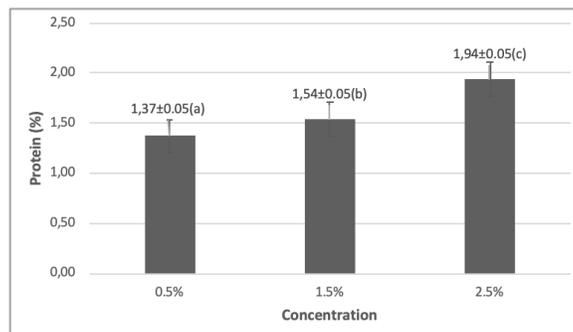


Figure 4. The Result of Protein Content

The protein content of albumin ointment at the flaxseed oil concentration of 0.5% was 1.37%, the concentration of 1.5% was 1.54%, and the concentration of 2.5% had a protein content of 1.94%. The highest protein content was obtained by hemp seed oil concentration of 2.5% at 1.94% and the lowest at a concentration of 0.5% at 1.37%. It can be concluded that the higher the concentration of flaxseed oil, the greater the protein content produced.

3.5 Fat Content

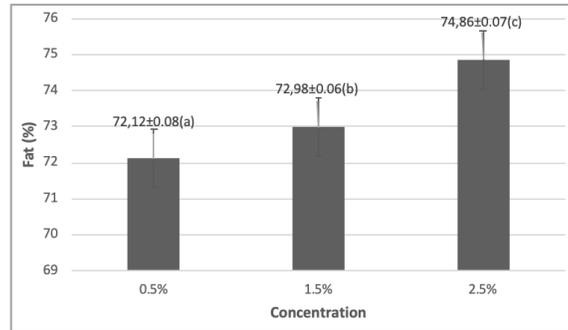


Figure 5. The Result of Fat Content

The fat content in the flaxseed oil concentration of 0.5% was 72.12%, the concentration of 1.5% was 72.98%, and the fat content in the concentration of 2.5% was 74.86%. The highest fat content was found in albumin ointment with a 2.5% concentration of 74.86%, while the lowest was a 0.5% concentration of 72.12%. The fat content in albumin ointment comes from the added omega 3 and omega 6 source oils, as well as the base of the ointment used.

3.6 Water Content

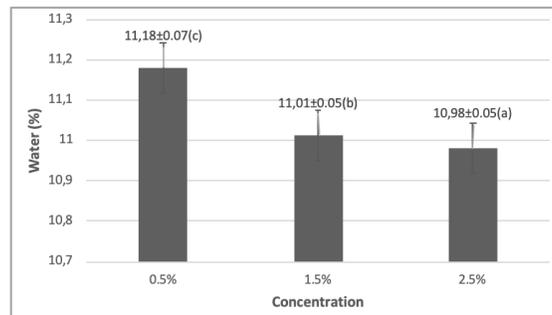


Figure 6. The Result of Water Content

The result of water content at 0.5% flaxseed oil concentration was 11.18%, at a concentration of 1.5% at 11.01%, and a concentration of 2.5% at 10.98%. The highest water content value was at a concentration of 0.5% at 11.18% while the lowest water content was at a concentration of 2.5% which was 10.98%. The value of the water content was getting lower along with the increase in the concentration of flaxseed oil applied to the albumin ointment.

3.7 Organoleptic

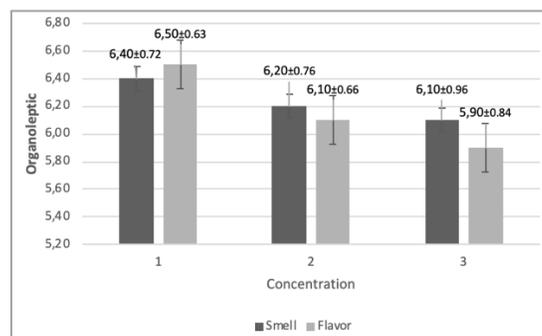


Figure 7. The result of Organoleptic

Organoleptic assessment of albumin ointment with different concentrations of flaxseed oil showed differences. In the treatment of flaxseed oil concentration of 0.5% the color parameter shows a value of 6.5, at a concentration of 1.5% of 6.1, and at a concentration of 2.5% indicates a value of 5.9. Meanwhile, the treatment of flaxseed oil concentrations with different aroma parameters showed different values. The aroma value of 0.5% concentration is 6.4, 1.5% concentration is 6.2, and at a concentration of 2.5% indicates a value of 6.1. The color and aroma parameters obtained the highest value respectively at the concentration of 0.5%, while the concentration that had the lowest value was the concentration of 2.5% flaxseed oil. The highest values for color and aroma parameters at a concentration of 0.5% were 6.5 and 6.4, respectively. The highest value indicated that the panelists liked the color and aroma of the albumin ointment which was produced from the 0.5% concentration of flaxseed oil. Meanwhile, the lowest value of color

and aroma parameters at 2.5% concentration treatment were 5.9 and 6.1, respectively. The lowest value obtained indicated that the panelists did not like the color and aroma of the albumin ointment resulting from a concentration of 2.5%.

3.8 Experimental Animal Testing

After knowing the optimal concentration of flaxseed oil for making the best quality albumin ointment, namely 2.5% concentration, then tested on experimental mice to determine the effect of albumin ointment on the closure of the cut, further tests were analysis of the fatty acid profile of albumin ointment, and zinc levels test. Albumin ointment with the best concentration of 2.5% was compared with negative controls and positive controls. Mice were injured 2 cm in length. The wound closure process was measured for 7 days with observations on the 3rd, 5th and 7th day.

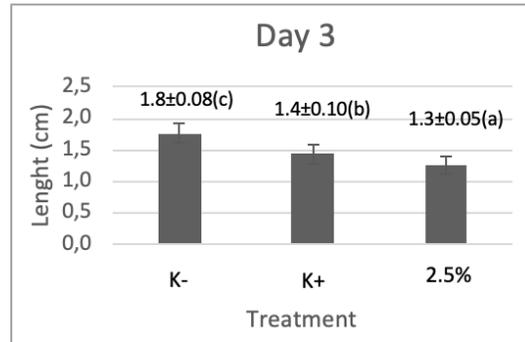


Figure 8. The Result of Day 3

On day 3, different treatments showed different results of wound closure. The negative control treatment showed an average wound length of 1.8 cm, the positive control treatment was 1.4 cm, and the albumin ointment treatment concentration of 2.5% was 1.3 cm. The best wound closure on day 3 was obtained by treatment of 2.5% albumin ointment with a remaining wound of 1.3 cm, while the longest wound closure was in the negative control treatment of 1.8 cm. This means that the wound closure process in the best treatment on day 3 was 35%.

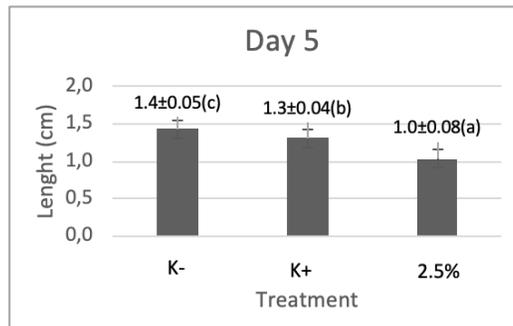


Figure 9. The Result of Day 5

Different treatments showed different results of wound closure on day 5. The negative control treatment showed an average wound length of 1.4 cm, the positive control treatment was 1.3 cm, and the 2.5% concentration of albumin ointment treatment was 1 cm. The best wound closure on the 5th day was obtained by the 2.5% concentration of albumin ointment, namely 1 cm, while the longest wound closure was in the negative control treatment of 1.4 cm. This means that the wound closure process on the best treatment on day 5 is 50%.

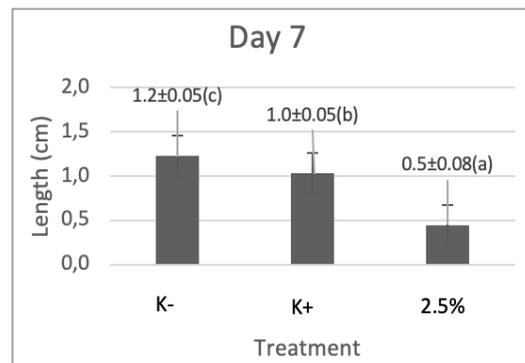


Figure 10. The Result of Day 7

The different treatments showed different wound closure results on day 7. Negative control treatment showed an average wound length of 1.2 cm, positive control treatment was 1 cm, and albumin ointment treatment concentration of 2.5% was 0.5 cm. The fastest wound closure on the 7th day was obtained by the 2.5% concentration of albumin ointment treatment, namely 0.5 cm, while the longest wound closure was in the negative control treatment of 1.2 cm. This means that the wound closure process on the best treatment on the day 7 is 75%.

3.9 Fatty Acid Profile

Jenis Asam Lemak	Unit	Result
Mono Unsaturated Fatty Acids (MUFA)		
Omega 9		
C 18: 1 (oleic acid)	%	15.04
Total	%	15.04
C 14: 1 (miristoleic acid)	%	3.09
C 16: 1 (palmitoleic acid)	%	4.34
Total	%	22.47
Poly Unsaturated Fatty Acids (PUFA)		
Omega 3		
C 20: 5 (eicosapentanoic acid)	%	4.39
C 18: 3 (linolenic acid)	%	12.90
C 22: 6 (docosahexaenoic acid)	%	1.14
Total	%	18.43
Omega 6		
C 18: 2 (linoleic acid)	%	16.54
C 20: 3 (eicosatrienoic acid)	%	3.74
Total	%	20.28
Saturated Fatty Acid (SFA)		
C 18: 0 (stearic acid)	%	1.98
C 16: 0 (palmitic acid)	%	6.02
C 12: 0 (lauric acid)	%	0.45
Total	%	8.45

The fatty acid content of albumin ointment had a different composition in the 20 grams of albumin ointment tested. The highest fatty acid content was found in omega 6 fatty acids, namely 20.28%, namely lileoleic acid at 16.54%. While the lowest fatty acid content was obtained by saturated fatty acids at 8.45%, namely lauric acid at 0.45%. High levels of omega 6 are obtained from other components added to albumin ointment such as sunflower seed oil and snakehead fish albumin. The high and low levels of fatty acids in albumin ointment can be affected by the addition of other substances and storage temperature. If the storage temperature is higher, the fatty acid content will be lower.

3.10 Zinc Content

The best concentration of Zn in albumin ointment was 3.04 mg / 100g. Components that accelerate wound closure are the mineral zinc (Zn), omega 3 and omega 6 fatty acids in albumin ointment. Omega-3 fatty acids, especially EPA (Eicosapentaenoic acid) in albumin ointment and mineral content act as nutrients to accelerate incision wound closure by helping fibroblasts in synthesizing collagen to form scar tissue in incisions in the proliferation phase.

IV CONCLUSION

Flaxseed oil with a concentration of 2.5% is the optimal concentration to produce the best albumin ointment with a pH value of 6.7, a viscosity value of 18986 cP, an omega-3 level of 18.43, a protein content of 1.94, a fat content of 74.86, and a moisture content of 10.98.

The results showed that giving different treatments to wounds had a significant effect on the wound closure process. On the 3rd, 5th, and 7th day of observation, the best wound closure process was 75% in experimental animals treated with albumin ointment on day 7.

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Nursing perspective of patient in post operative outcome of laparoscopic cholecystectomy versus open cholecystectomy: A prospective study from a tertiary care hospital in Guwahati, Assam

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DOI: 10.29322/IJSRP.10.09.2020.p10553
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10553>

Abstract- INTRODUCTION & BACKGROUND:

This series has focused on the care of patients undergoing cholecystectomy as Gallstones are the most common abdominal-associated reason for hospital admission in the surgical units in GMCH & MMCH . It has identified the key areas nurses need to understand when caring for these patients. Effective pre-operative assessment, good surgical technique and well managed post-operative care all contribute to a successful outcome for patients.

AIMS AND OBJECTIVES: The aim of the study is to access the Nursing perspective in the of outcome of Laparoscopic Cholecystectomy versus Open Cholecystectomy

METHOD: It is a Prospective, comparative, Observational survey design which was conducted in tertiary care Hospital in Assam. The Rational for selecting this institution for the study was that Both LC and OC are done on a regular basis and wide coverage of population in the surgical units. The sample size consists of 1000 patients. 500 patients from OC group and 500 from LC group.

RESULTS: The Mean VAS score is 4.97 in (LC) and 8.14 in (OC) The mean duration of analgesic requirement in LC was 2.2 days as compared to 3.6 days for OC The mean duration of antibiotic requirement in LC was 3.3 days as compared to 6.1 days for OC. The complication rate was 8.19% in LC group and 17.9% in OC group which is significantly higher in OC group (P value=.0001).Post-operative The % of Wound Infection in OC is 7.5% and 3.3% in LC. The mean duration of hospital stay in LC is 6.7 days OC is 10 days.

CONCLUSION: Despite being the superiority of LC in terms of overall morbidity, hospital stay and lesser pain and analgesic requirement, **patients admitting in Tertiary care hospital especially those belongs to rural areas, do not prefer the laparoscopic approach.** LC in local language is referred to as laser surgery and chances of reoccurrence in LC.

These patient's preference for OC has to do with local beliefs like recurrence of the same symptoms ,morbidity and numerous complications caused by LC .Greater fear and little knowledge of LC prior to surgery is associated with a slower or not opted for LC in tertiary care hospital .It is surmise that patient beliefs, which are not founded in scientific fact, needs strong communication and education by the Nurses to increase awareness amongst the patients coming about the advantages and benefits of laparoscopic surgery.

Index Terms- laparoscopic surgery. Open Cholecystectomy.

I. INTRODUCTION

Gallstone disease continues to be one of the most common digestive disorders worldwide. The prevalence of gallstone formation increases with age.¹ in the past few years

This series has focused on the care of patients undergoing cholecystectomy as Gallstones are the most common abdominal-associated reason for hospital admission in the surgical units in GMCH & MMCH . It has identified the key areas nurses need to understand when caring for these patients. Effective pre-operative assessment, good surgical technique and well managed post-operative care all contribute to a successful outcome for patients.

II. SIGNIFICANCE OF THE STUDY

In view of the wide coverage of population in the surgical wards with cholecystectomies, the evaluations on patient satisfaction with postoperative outcome would contribute the merits and demerits of LC and OC from nursing perception.

Results and conclusions will be different in different in settings with a thorough, complete and considering all details in depth with factors influencing patient's satisfaction in post-operative outcome in cholecystectomy either by LC or by OC

III. STATEMENT OF THE PROBLEM:

“NURSING PERSPECTIVE OF PATIENT IN POST OPERATIVE OUTCOME OF LAPAROSCOPIC CHOLECYSTECTOMY VERSUS OPEN CHOLECYSTECTOMY: A PROSPECTIVE STUDY FROM A TERTIARY CARE HOSPITAL IN GUWAHATI, ASSAM”.

AIMM:The aim of the study is to access the Nursing perspective in the of outcome of Laparoscopic Cholecystectomy versus Open Cholecystectomy

OBJECTIVES: The Primary objective is to assess the post-operative outcomes of laparoscopic Cholecystectomy versus open cholecystectomy.

Theoretical Framework²

The theoretical framework used to guide this study is “The Donabedian Model”. The Donabedian model is a [conceptual model](#) that provides a framework for assessing and evaluating the post-operative outcome of LC and OC. According to the model, information about outcome of LC and OC can be drawn from three categories: “structure,” “process,” and “outcomes.” Structure describes the Variables in this series, including Patient demographic, physical and psychological factors. **Process** denotes the transactions between patients and health care providers through the process of cholecystectomy operation either by LC or by OC. Finally, outcomes refer to the effects of healthcare on the health status of patients after LC and OC in terms of Patient satisfaction and Post-operative outcome.

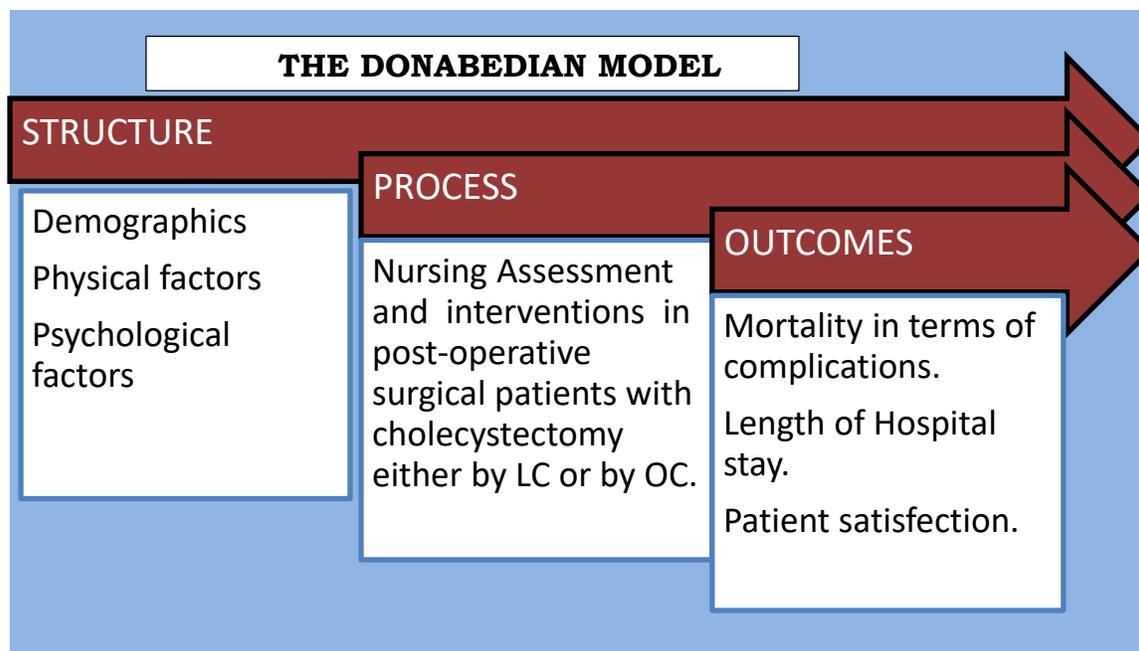
Dimensions of Care: -The model is representing by a chain of three boxes containing structure, process, and outcome of patient’s in surgical wards who had undergone cholecystectomy either by LC or by OC. These boxes represent three types of information that

may be collected in order to draw inferences about patient’s outcome of LC and OC perceived by the **Nurses**.

Structure: - It includes the selected Patient’s demographic, physical factors and psychological factors in this series. Structure includes all the variables which is the backbone of the study,

Process: - It is the cholecystectomy operation either by LC and OC. Process also includes the process of accessing post-operative surgical patients in post-operative pain assessment through VAS score, Nursing interventions in pain management, analgesic requirement, antibiotic requirement, nursing interventions in post-operative drainage, Ryle’s tube, catheter, Post-operative wound care, Post-operative Diet, Interventions in ambulation, and post-operative satisfaction.

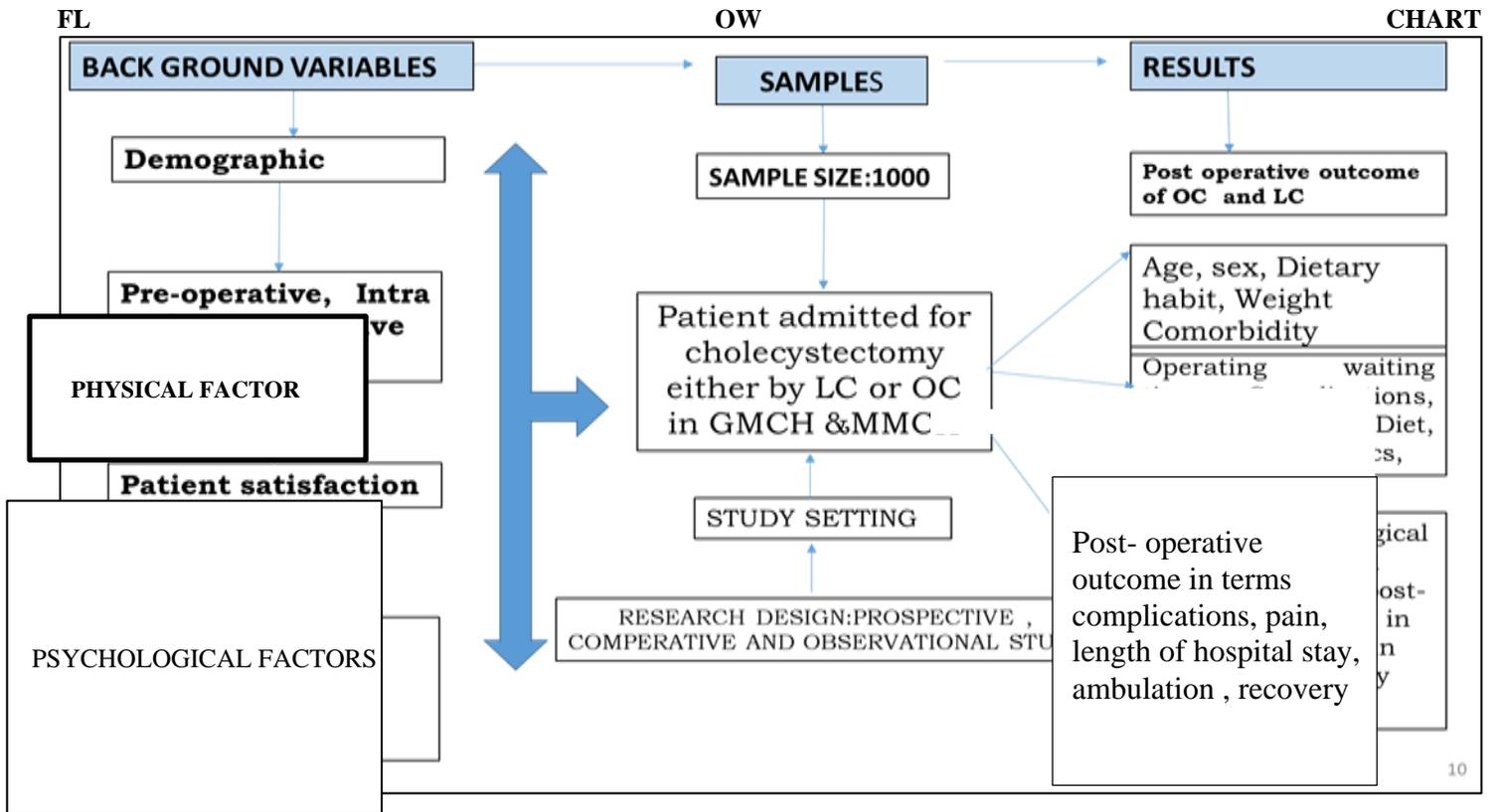
Outcome contains all the effects of nursing interventions on patients including changes in the post-operative health status, basically intervened as reduce post-operative complications, early recovery, resumption of post-operative diet. Post-operative ambulation and length of hospital stay. Outcomes are the most important indicators of patient satisfaction in both LC and OC groups.



The Donabedian model is a conceptual model that provides a framework for post-operative outcome in LC and OC

IV. METHODOLOGY

Research methodology is the systematic way to solve research problem. This chapter provides a brief description of method adopted to conduct the study. This chapter includes research approach, research design, study setting, sample size, and sampling technique. It further deals with development of tool, procedure for data collection, and for data analysis.



Data collection procedure:

This is a comparative, observational survey design study of one thousand (1000) patients from various parts of Upper and Lower Assam and adjoining areas, who were admitted in the Department of General Surgery, Gauhati Medical College & Hospital, since 2014 to 2017. Their medical records were analyzed, nursing interventions done and day to day recovery was assessed by applying the self-prepared close ended questionnaire and SAPS (short assessment and patient satisfaction) and outcomes evaluated.

PLAN FOR ANALYSIS OF DATA

The data of outcome were analyzed and compared according to standard statistical analysis. Post-operative data were all recorded and analyzed, using simple statistical tests (Z-test) to compare the result. Data were subjected to computerized analysis. Continuous variables are given as median (range) and were analyzed and Values for $p < 0.05$ were significant.

V. ANALYSIS AND INTERPRETATION

TABLE :1 :-GENDER

Gender	LC(F & %) N=500	OC(F& %) N=500	Total %	z- score	p- value
Male	241(48.2%)	199(39.8%)	440(44.0%)	2.675	.0073
Female	259(51.8%)	301(60.2%)	560(56%)		
Total	500(100.0%)	500(100.0%)	1000(100%)		

There is a female preponderance in both the groups with 51.8% of patients being female patients in LC group and 60.2% patients being female in OC group as shown in Table -1. Overall, 56% female and 44% male sample have collected for the study. The result is significant at $p < .05$. Male: female ratio in LC [0.9:1] and in OC [0.6:1]. Overall male: female ratio in LC and OC is 0.7:1.

FIGURE: 1:- GENDER

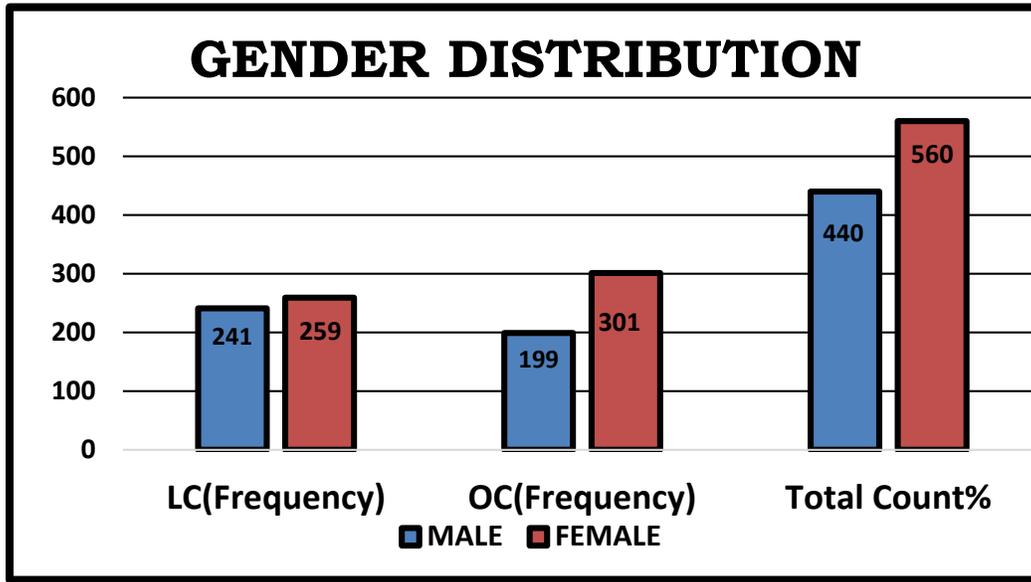


TABLE 2 :- AGE DISTRIBUTION

Range (Age group)	Laparoscopic Cholecystectomy Frequency & % N=500	Open Cholecystectomy Frequency & % N=500	TOTAL %
13-18 years	21(4.2%)	15(3%)	36 (3.6%)
19-25 years	42(8.4%)	49(9.8%)	91(9.1%)
26-35 years	115(23%)	126(25.2%)	241(24.1%)
36-45 years	146(29.2%)	132(26.4%)	278(27.8%)
46-55 years	111(22.2%)	102(20.4%)	213(21.3%)
56-65 years	53(10.3%)	67(13.4%)	120(12.0%)
>66 years	12(2.4%)	9(1.8%)	21(2.1%)
TOTAL	500(100%)	500(100%)	1000

FIGURE- 2: AGE DISTRIBUTION

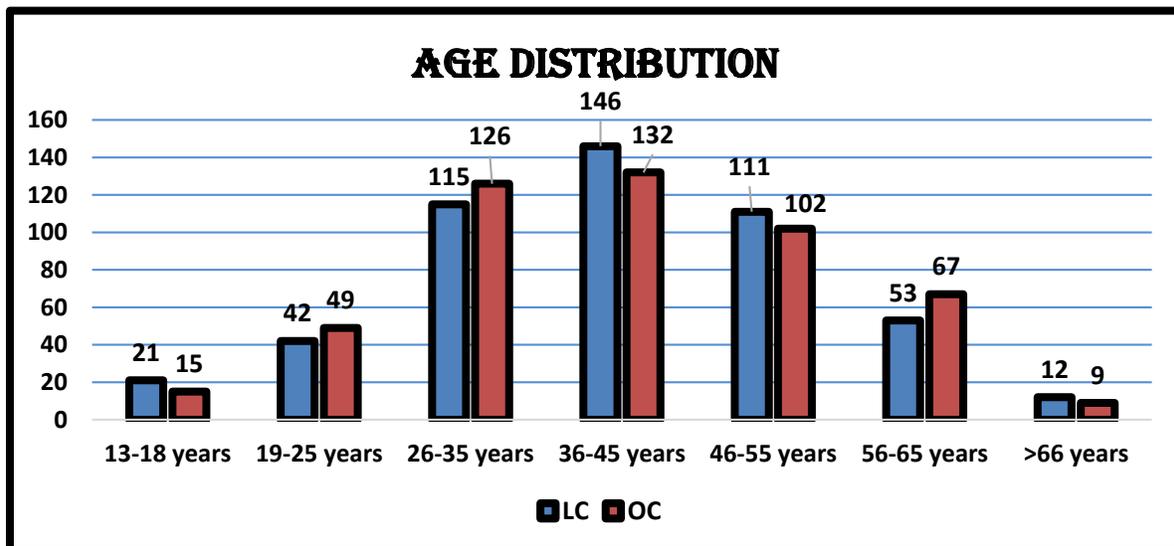


Table-2 depicted that maximum sufferer were between the age group of 26yrs to 55 yrs. 27.8% and 24.1% from the total samples fall under the age group of 36-45 years and 26 to 35yrs respectively. Sample distribution is decreasing in lower age between 13-18 years is 4.2% in LC an 3% in OC and higher age group i.e. in age group above 66 years is 2.4% in LC and 1.8% in OC. The Mean age group is 41.65years in OC and 41.25 years in LC.

TABLES -3: PATIENTS WITH COMORBID CONDITIONS IN LC AND OC.

Comorbid Condition	LC (F) & % N=500	OC (F & %) N=500	z-score	p-value
	142(28.4%)	218(43.6%)	-5.005	0

In this series from the table-3 it is stated that 43.6% of OC patients had comorbid conditions while in LC 28.4% of the patients had Comorbidity which is significant at $p < 0.05$. The co- morbid conditions are HPT, DM, Asthma, Renal Calculus, Hypo or hyper- thyroidism, cardiac diseases and COPD.

FIGURE -3: COMORBID CONDITIONS IN LC AND OC

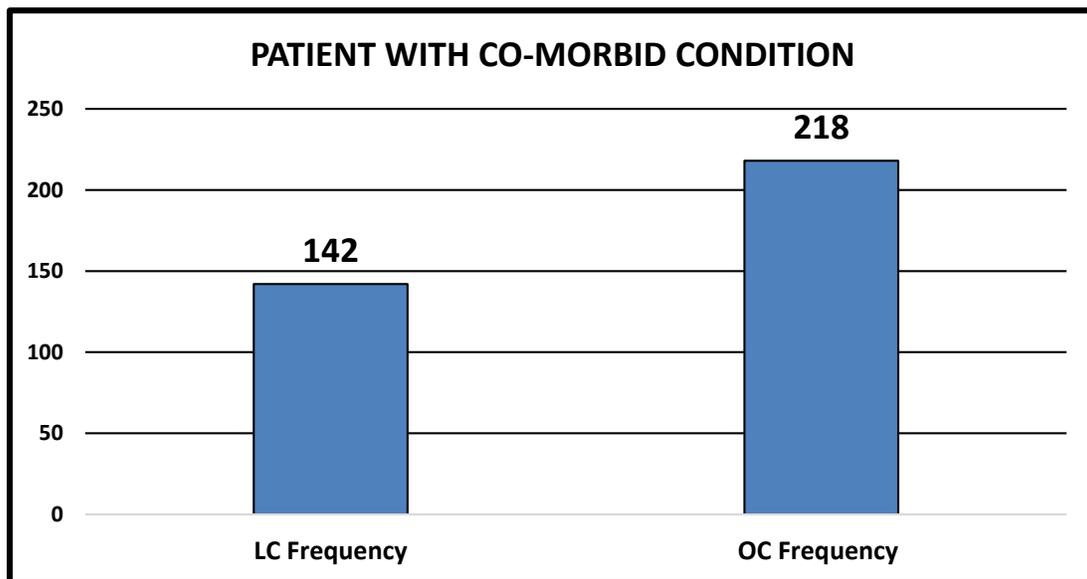


TABLE 4: PATIENT DISTRIBUTION IN HOSPITAL

Hospitals	LC(F & %) N=500	OC (F & %) N=500	TOTAL
GMCH	396(73.8%)	215(43.0%)	611(61.1%)
MMCH	131(26.2%)	285(57.0%)	416(41.6%)
Total	500(100.0%)	500(100%)	1000

In this series 73.8% of LC and 43.0% of OC patients were from GMCH and 26.2% of LC and 57% of OC patients were from MMCH. A total of 61.1% patients were from GMCH and 41.6% patients were from MMCH as shown in table 4.

FIGURE -4: PATIENT DISTRIBUTION IN HOSPITAL

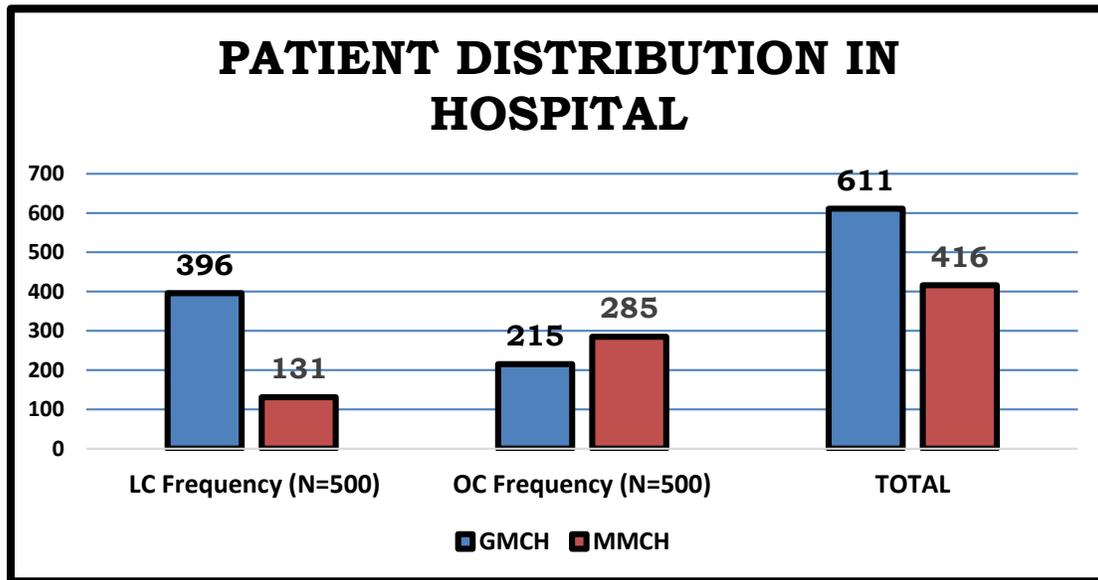
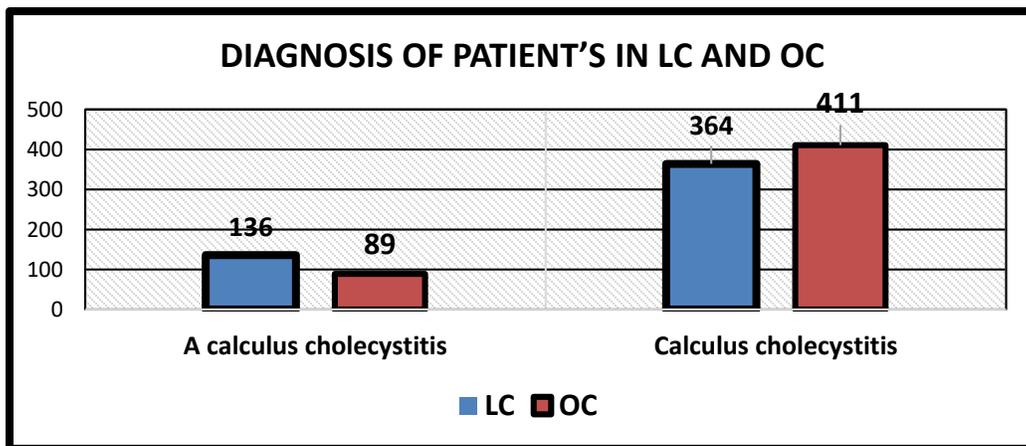


TABLE 5:- DIAGNOSIS OF PATIENT'S IN LC AND OC

DIAGNOSIS	LC(F & %) N=500	OC (F& %) N=500	Total (%)
Acalculus cholecystitis	136(27.2%)	89(17.8%)	225(22.5%)
Calculus cholecystitis	364(72.8%)	411(82.2%)	775(77.5%)

FIGURE 5: DIAGNOSIS OF PATIENT'S IN LC AND OC



The above data as shown in table-5, depicted that 27.2% of LC patients were diagnosed with acalculus cholecystitis and 72.8% were diagnosed with calculus cholecystitis. In OC 17.8% had acalculus cholecystitis and 82.2% had calculus cholecystitis.

TABLE-6: NURSING ASSESSMENT OF POST OPERATIVE PAIN (VAS SCORE)

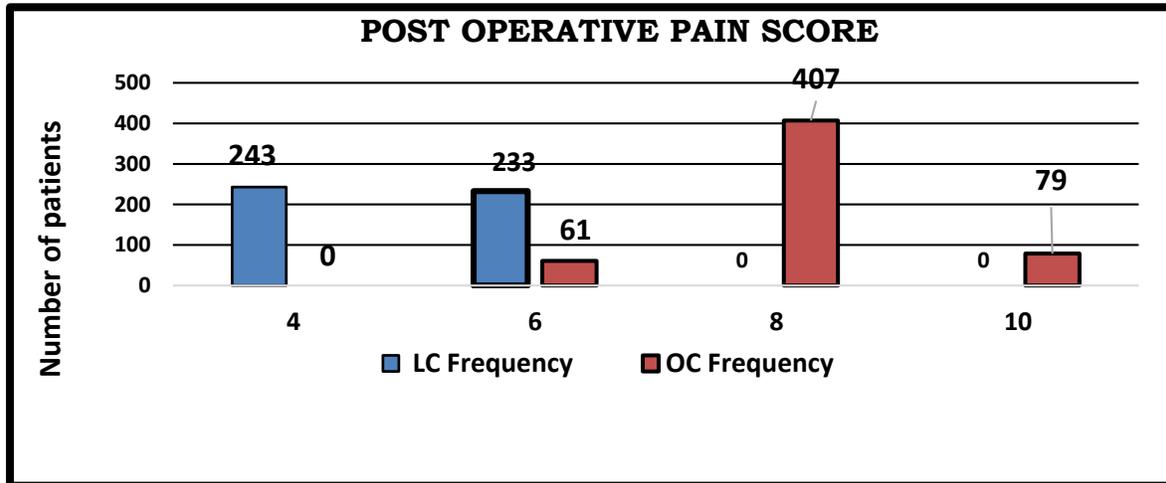
VAS Score	LC F & % N=476	OC F & % N=524	Total %	z-score	p-value
4	243(51.04%)	0(0%)	243(24.3%)	-18.79	.00001
6	233(48.94%)	61(11.64%)	294(29.4%)	-12.93	.00001
8	0(0%)	407(77.67%)	407(40.7%)	24.969	.00001

10 0(%) 79(15.07%) 79(7.9%) 8.8272 .00001

The result is significant at $p < .05$

Nurses classify the pain as Mild (score 0-4), Moderate (score 5-7) severe (score 8-10). VAS score is 4 in 51% of LC and 0 % in OC patients. VAS score is 6 in 48.9% in LC and 11.6% in OC. VAS score 8 is 0% in LC and 77.6% in OC and VAS score 10 is 15% in OC as shown in table -6.

FIGURE: -6 :-POST OPERATIVE PAIN SCORE



In this series nurses managed and successfully deal with pain with VAS score as it is a key element in post-operative care for cholecystectomy patient to make the patient carry out coughing, breathing exercises, and could have the ability to submit bed, crunches, and, gradually, walk effectively.

TABLE-6A) AVERAGE POST OPERATIVE PAIN SCORE IN LC & OC

VAS	Minimum	Maximum	Mean	SD	Gr mean	Gr SD
LC	4	6	4.97	1.000	6.6583	1.854
OC	6	10	8.14	0.88		

In Table 6(A) data stated that the maximum intensity of pain score in LC is 6 and minimum is 4 whereas in OC maximum intensity is 10 and minimum is 6. There is significant difference in the intensity of post-operative pain score in LC and OC from the nursing perception. The average pain score in LC is 4.97 and in OC it is 8.14. The group mean in both LC and OC for pain is 6.65 as shown in table-6(A).

TABLE-7: POST- OPERATIVE DURATION OF ANALGESIC

Days	LC Frequency & % N=476	OC Frequency & % N=524	Total %	z-score	p-value
1-3 Days	476(100%)	205(39.12%)	681(68.1%)	-20.62	<.000
4-5 Days	00(0%)	319(60.87%)	319(31.9%)		
Total	476(100%)	524(100%)	1000(100%)		

The value of p is $< .00001$. The result is significant at $p < .05$.

Table-7 showed that LC patients requires analgesic till postoperative day-03 and in OC it may be needed till Post-operative day-5 (60.8%). This can be explainable because of larger incision and more tissue destruction in open cholecystectomy

FIGURE-7:- IN POST OPERATIVE ANALGESICS REQUIREMENT

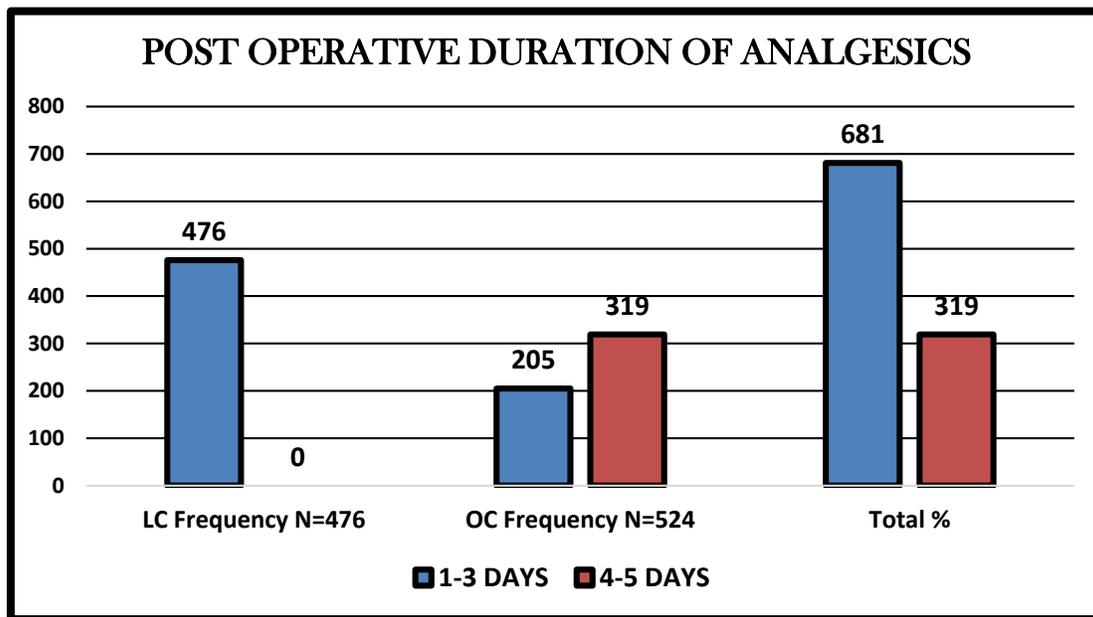


TABLE-7: AVERAGE DURATION OF POST OPERATIVE ANALGESICS REQUIREMENT

Antibiotics	Minimum	Maximum	Mean	SD	Gr Mean	Gr SD
LC	2	3	2.21	0.36	2.94	0.84
OC	3	5	3.60	0.48		

The above table-7 shows that the minimum duration of injectable analgesics is 2 days for LC and 3 days for OC and Maximum duration is 3 days for LC and 5 days for OC in this series.

Statistics show that almost 10%, 20-40% and 40-60% of the patients undergoing surgery suffer from low pain, moderate pain and severe pain, respectively (Zakeri Moghaddam et al., 2011). Pain diagnosis is one of the most important duties of nurses and pain relief is a basis for nursing care (Ghamari Zare, Anousheh, Vanaki, & Hajizadeh, 2008). Effective pain management after surgery facilitates the patient’s recovery and decreases the length of hospitalization (Ghamari Zare et al., 2008).

TABLE-8: NURSING ASSESSMENT IN POST OPERATIVE INJECTABLE ANTIBIOTICS

DAYS	Laparoscopic Cholecystectomy Frequency & % N=476	Open Cholecystectomy Frequency & % N=524	Total	z-score	p-value
Up to 5 days	476(100%)	187(35.68%)	663(63.3%)	21.48	<.000
> 5 days	00(0%)	337(64.31%)	337(33.7%)		
TOTAL	500(100%)	524(100%)	1000(100%)		

The result is significant at $p < .05$. Post-operative injectable antibiotic requirement is 100% in LC and 35.6% in OC up to 5 days and 64.3% OC patients required injectable antibiotics more than 5 days as shown in table -8.

FIGURE-8: POST OPERATIVE DURATION OF INJECTABLE ANTIBIOTICS.

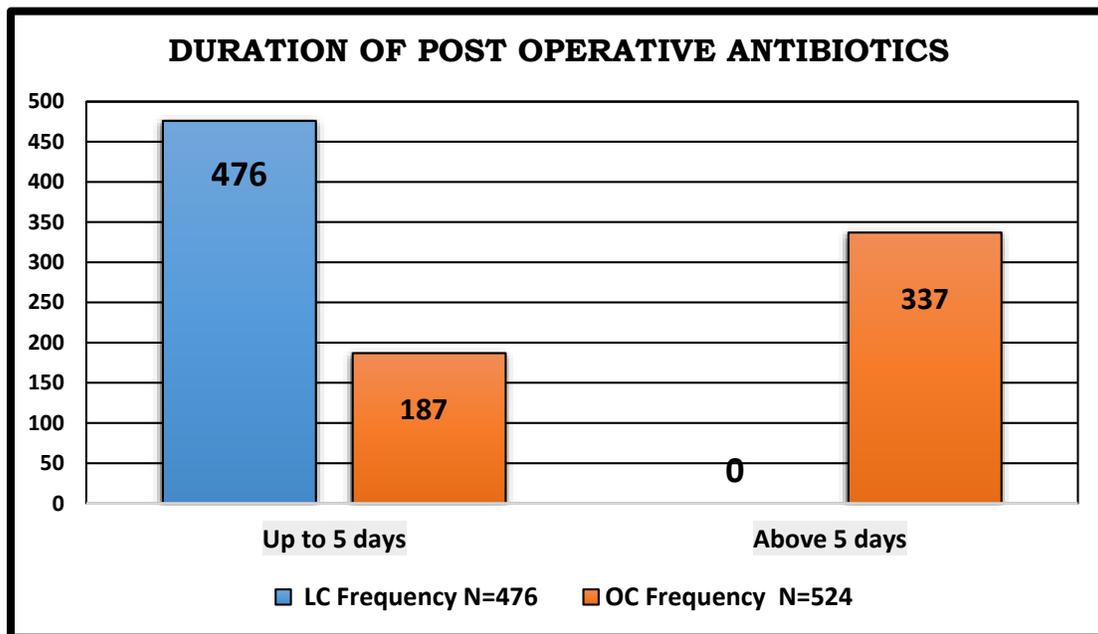


TABLE-8: AVERAGE DURATION OF POST OPERATIVE INJECTABLE ANTIBIOTIC REQUIREMENT.

	Minimum	Maximum	Mean	SD	Gr Mean	Gr SD
LC	3 days	5 days	3.37	0.498	6.19	0.977
OC	5 days	9 days	6.192	0.977		

Duration of administration of antibiotics is greater in all aspects as minimum, maximum and average days in open cholecystectomy as compared to laparoscopic cholecystectomy shown in table 10 (B). In LC the minimum duration of antibiotic is for 3 days and maximum is 5 days and in OC minimum duration is for 5 days and maximum is for 9 days with an average duration of post-operative injectable antibiotics is for 3.37days in LC and 6.19 days in OC. The group average duration of post-operative injectable antibiotic requirement in Cholecystectomy is 6.19 days.

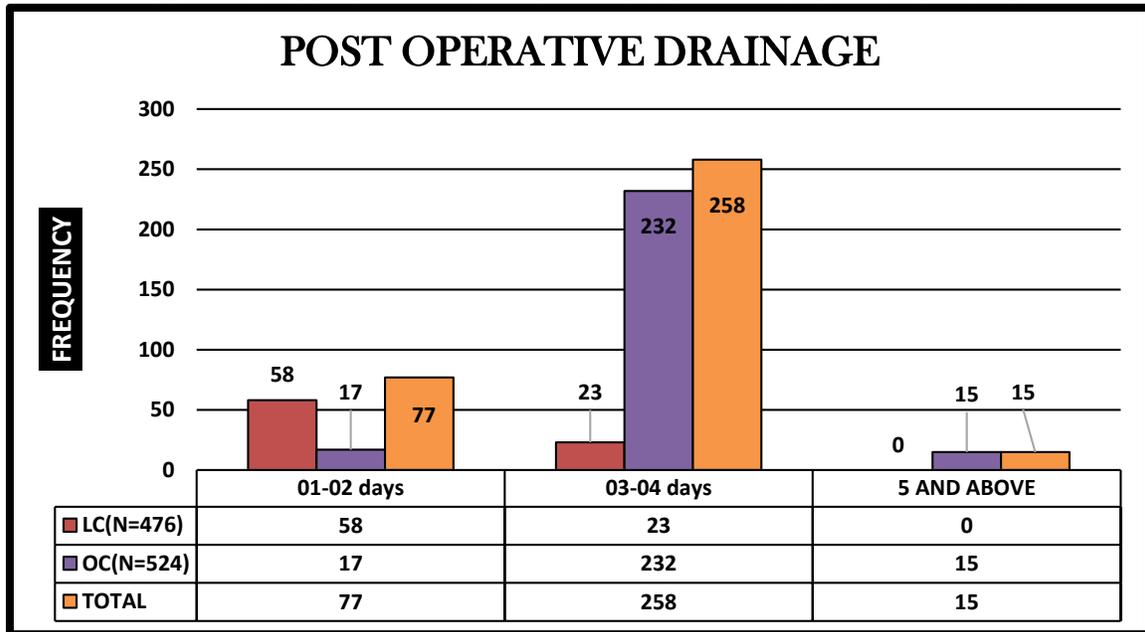
TABLE-10:-NURSING ASSESSMENT IN POST OPERATIVE DRAINAGE

DAYS (range)	Laparoscopic Cholecystectomy Frequency & % N=476	Open Cholecystectomy Frequency & % N=524	Total %	Z -score	P- value
1-2	58(12.1%)	17(3.2%)	77(7.7%)	5.3609	< .00001
3-4	23(4.8%)	232(44.27%)	258(25.8%)	-14.291	< .00001
>5	0	15(2.8%)	15(1.5%)	-3.7193	< .00001
Total	81(17.0%)	264(50.38%)	350(35.0%)	-11.084	< .00001

The result is significant at $p < .05$.

After providing required nursing interventions and management in post-operative drainage care, there were no infection in the drainage site and no post-operative bleeding seen from the drain in LC and OC. 12.1% Patient from LC require drain for 2 days and 4.8% patient needed for 3-4 days post-operatively, in OC 3.2% patient required drainage for 2 days and 44.2% patients for 3-4 days and 2.8% patient required it for more than 5 days due to high drain output.

FIGURE-10: POST OPERATIVE DURATION OF DRAINAGE IN LC AND OC



Drains were removed as soon as practicable and as ordered by the surgeon. The longer a drain remains in situ, the higher risk of infection as well as development of granulation tissue around the drain site, causing increased pain and trauma upon removal which was not seen in this series.

In this series the average duration of post-operative drainage is 2.6 days in LC and 3.3 days in OC. The average days for drainage in cholecystectomy are 3.1 days post-operatively.

TABLE-11: NURSING ASSESSMENT IN POST OPERATIVE DURATION OF CATHETER

DAY	LC (F & %)N=476	OC(F & %) N=524	Total%	z-score	p- value
0	374(78.57%)	299(57.0%)	673(67.3)	7.2416.	< .00001
2	96(20.16%)	31(5.9%)	127(12.7)	6.7599	< .00001
3	6 (1.26%)	138(26.33%)	144(14.4)	-11.279	< .00001
4	0(0)	56(10.68%)	56(5.6)	-7.3408.	< .00001

The result is significant at $p < .05$.

Table -11 depicted that 78.5% of patients from LC group and 57% patients from OC group did not required post-operative catheter. 20.1% from LC and 5.9% from OC patient had their removed by 2nd post-operative day .1.2% from LC and 26.3% from OC patient retained catheter till 3rd post-operative day and 10.6% patients had catheter till 4th post-operative day as shown in the above table-11.

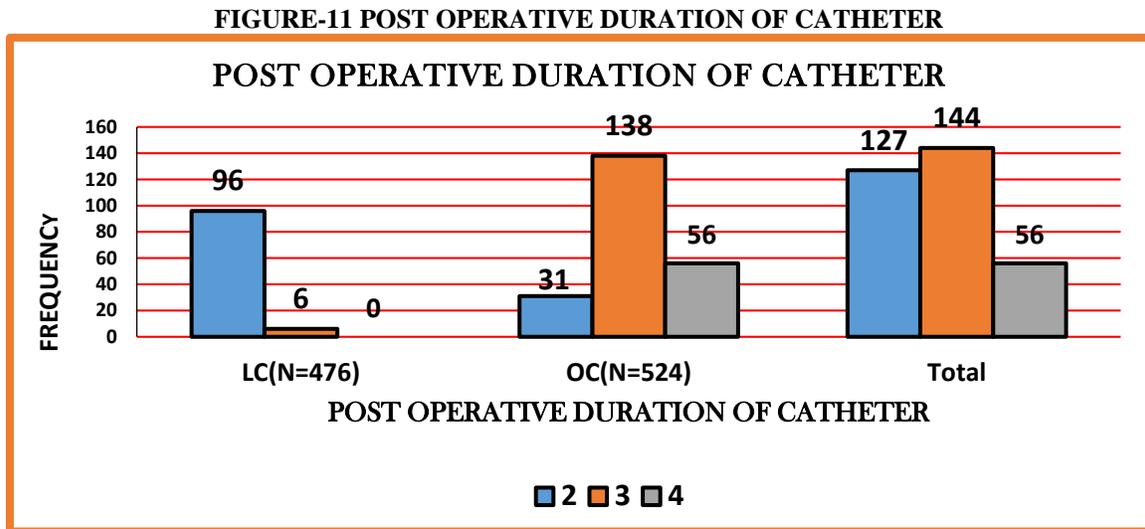


TABLE -11 (A) AVERAGE DURATION OF CATHETER IN LC AND OC

	Minimum days	Maximum days	Mean days	SD	Gr Mean	Gr SD
LC	2	3	2.34	0.852	3.21	1.351
OC	2	4	3.23	1.59		

The average duration of post-operative catheter is 2.34 days in LC and 3.23 days in OC, the average duration of catheter in cholecystectomy is 3.2 days in this series as shown in table-11(A).

TABLE -12: AVERAGE POST OPERATIVE DURATION OF RYLE’S TUBE

	Minimum	Maximum	MEAN	SD	Gr Mean	Gr SD
LC	1	3	2.59	0.49	1.29	1.56
OC	2	4	3.10	1.43		

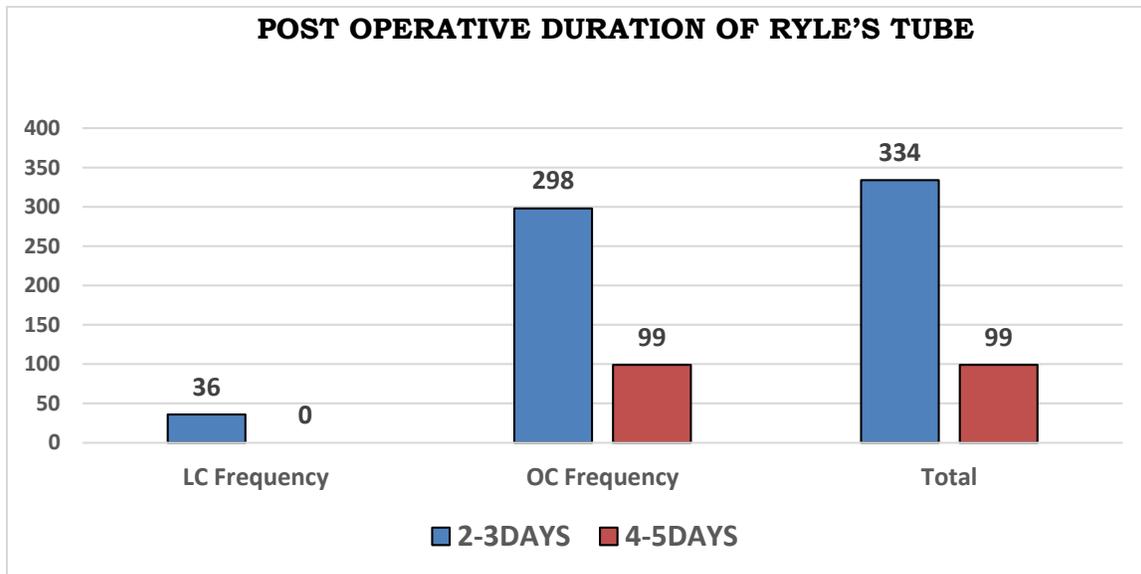
Table-12 shows that the average duration of post- 2.5 days in LC with minimum for 1 day and maximum for 3 days and in OC average operative of Ryle’s tube is 3.1 days with minimum for 2 days and maximum for 4 days.

TABLE-12 (B) POST OPERATIVE DURATION OF RYLE’S TUBE

DAYS	LC (F & %) N=476	Open Cholecystectomy Frequency & % N=524	total%	z-score	p-value
2-3	36(7.6%)	298(56.8%)	334(33.4%)	-16.510	.000
4-5	0	99(18.8%)	99(9.9%)	-9.990	.000

The result is significant at $p < .05$. The duration of post –operative Ryle’s tube is 2-3 days for 7.8 % of patients in LC and 56.8 % of patients in OC group, on the other hand 9.9 % of OC patients retained Ryle’s tube for 4-5 days for as shown in table-12(B).

FIGURE -12(B): DAY ON WHICH RYLES TUBE REMOVED



Post-operative Nurses interventions in Ryle's tube were gastric irrigation to empty the stomach bile and other content and amount and color 4 or 6 hourly to check the output and complications like bile leakage and bleeding.

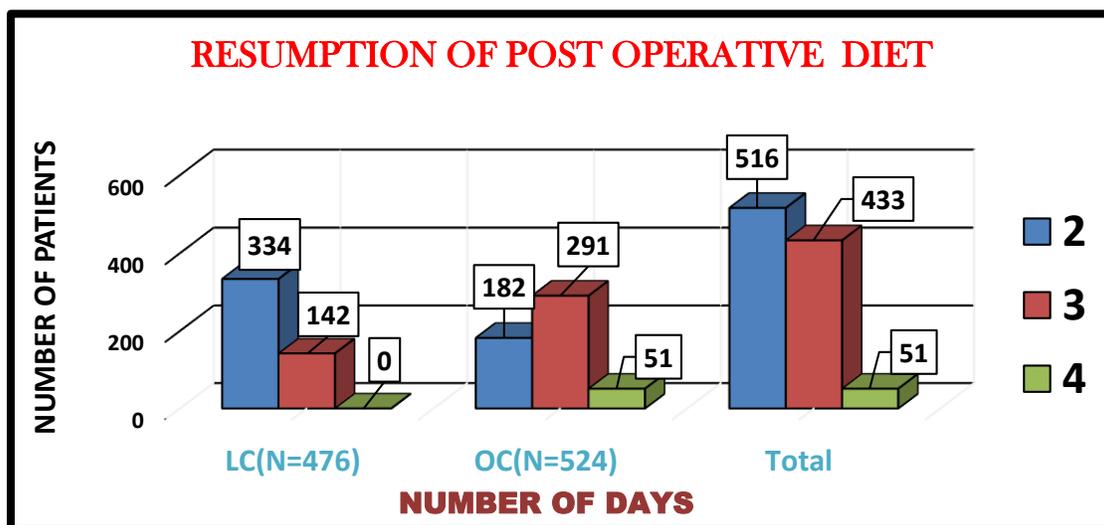
TABLE-13: POST OPERATIVE RESUMPTION OF ORAL DIET

Days	LC (F & %) N=476	OC(F &%) N=524	Total & %	z-score	p- value
2	334(70.17%)	182(34.73)	516(51.6%)	11.198	< .00001
3	142(29.83%)	291(55.5%)	433(43.3%)	-8.192	< .00001
4	0	51(9.7%)	51(5.1%)	-6.987	< .00001

The result is significant at $p < .05$.

From table -13 we can conclude that after assessing the presence of bowel movement and passage of flatulence. 70.1% of LC patient and 34.7 % of OC patients started with liquid diet or sips of water on post-operative day 2 .Due to the presence of Ryle's tube and patient c/o nausea and vomiting 29.8% in LC and 55.5% started liquid diet on post-operative day 3rd. 9.7% OC patient had fever nausea, and develop fullness had resume diet post-operative day 4th .

FIGURE-13: POST OPERATIVE RESUMPTION OF DIET



In this series a clear liquid diet or sips of water is given as first post-operative meal regardless of early or delayed administration after assessment of the presence or absence of bowel sounds by using a stethoscope, listening for the presence of bowel activity and gently palpating the abdomen noting firmness and excessive tenderness as indicated by the patient's response. Once bowel activity has returned, the diet is resume with a clear liquid diet and the patient instructed to sip a small amount of fluid to determine if he or she can tolerate fluid as per the treating doctor's instruction.

TABLE -14: NURSING ASSESSMENT IN POST-OPERATIVE AMBULATION

The value of p is < .00001. The result is significant at p < .05.

After the interventions 73.7% of the patients from LC and 1.9% of OC patients were ambulated on day 2nd. On post-operative day 3rd 26.2% form LC and 69.4% from OC patient were ambulated. 28.6% of the OC patient were ambulated on day or due to weakness and vomiting and general weakness postoperatively. Few OC patient delayed in ambulation due to presence of Ryle's tube and drainage.

Days	LC (F & %) N=476	OC (F & %)N=524	Total %	Z-SCORE	P – VALUE
2	351(73.7%)	10(1.9%)	361(36.1%)	22.9351	.00001
3	125(26.2%)	364(69.4%)	489(48.9)	-13.650	.00001
>4	0	150(28.6%)	150(15.0%)	-12.661	.00001

FIGURE-14 :- POST OPERATIVE AMBULATION

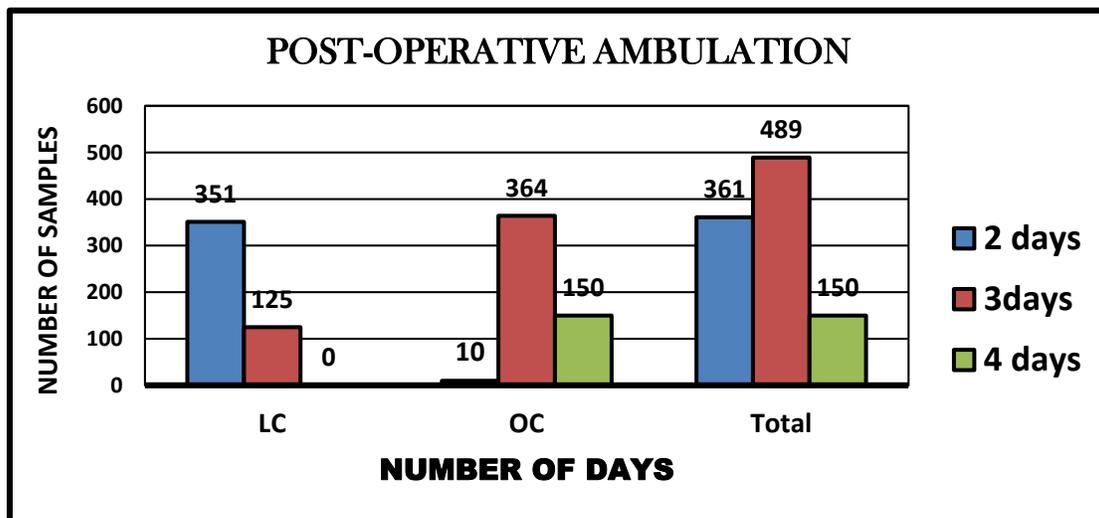


TABLE-15: - NURSING ASSESSMENT IN POST-OPERATIVE WOUND INFECTION.

Post-operative wound Infection	LC(F & % N=476)	OC (F & % N=524)	Total %	z-score	p-value
	16(3.3%)	40(7.5%)	56(5.6%)	2.9346	.00338

The result is significant at p < .05. In this series the number of post-operative wound infection is 3.3% in LC and 7.5% in OC. A total of 5.6% patients had post-operative wound infection in Cholecystectomy as shown in table-15.

FIGURE-15: -POST-OPERATIVE WOUND INFECTION

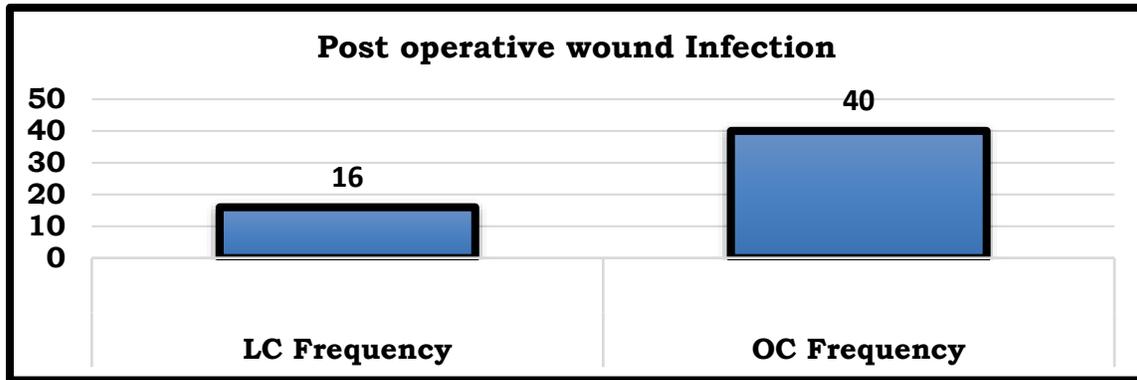


TABLE-16: NURSING ASSESSMENT IN POST-OPERATIVE COMPLICATIONS

Post-operative Complications	LC (F& %)	OC (F& %)	Z -score
	39(8.19%)	94(17.9%)	-4.5326

The result is significant at $p < .01$. P value $< .00001$

After Post – operative nursing assessment and interventions the % of complications were reduced, and total complications was 8.19% in LC and 17.9% in OC as stated in table-16.

FIGURE-16: POST PERATIVE COMPLICATIONS

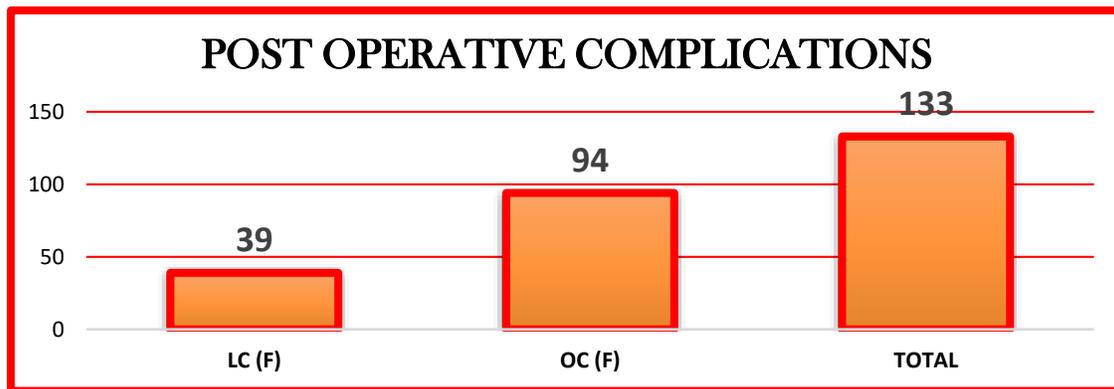


TABLE-17: POST-OPERATIVE PATIENT COMPLICATIONS

Complications	LC frequency & % N=476	OC frequency & % N=524	Total	z-score	p-value
Bile leakage	16(3.3%)	28(5.3%)	44(4.4%)	-3.3487	.000(S)
Fever	12(2.5%)	42(8.0%)	54(5.4%)	-3.8392	.000(S)
Malaise/weakness	6(1.2%)	11(2.0%)	17(1.7%)	-1.0247	.307(NS)
Vomiting	5(1%)	14(2.6%)	19(1.9%)	-1.8756	.060(NS)

The value of p is $< .00001$. The result is significant at $p < .05$

In this series the post-operative complication consist of Bile leakage 16(3.3%) in LC and 28(5.3%) in OC, fever 12(2.5%) in LC 42(8.0%) in OC Weakness/Malaise 6(1.2%) in LC and 11(2.0%) in OC vomiting 5(1%) in LC and 14(2.6%) in OC as shown in table-17 .

FIGURE-17: POST OPERATIVE PATIENT COMPLICATIONS

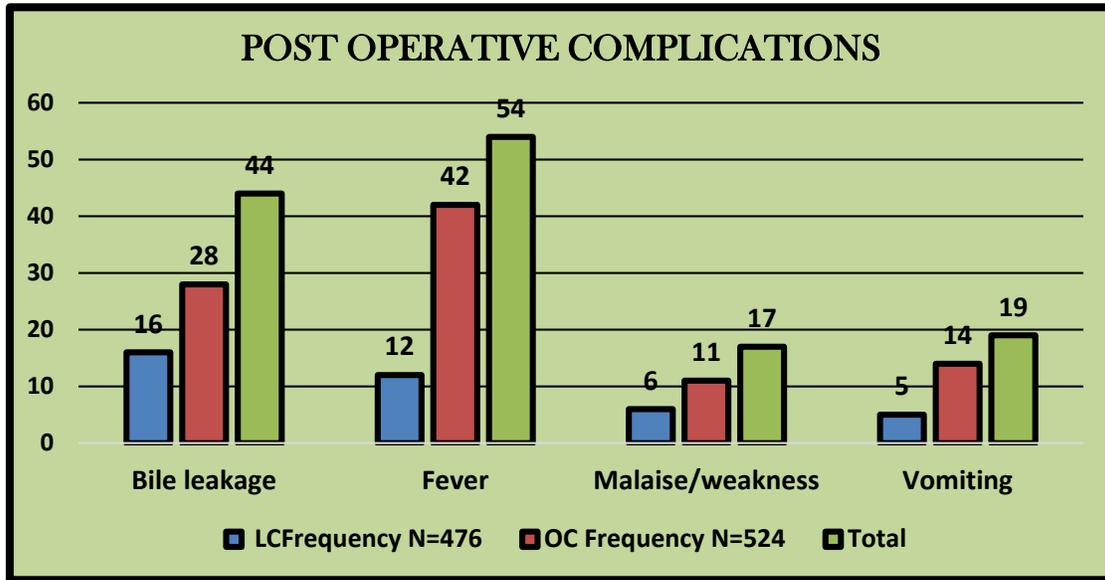


TABLE-18: POST OPERATIVE OF HOSPITAL STAY

Days (Range)	LC (F & %) N=476	OC (F & %) N=524	Total%	Z -score	P value
Up to 7 days	476(100%)	288(54.9%)	764(76.4)	16.751	.0001
>7days	00	236(45.0%)	236(23.6)		
Total	476(100%)	524(100%)	1000		

The result is significant at $p < .01$.

In this series the duration of hospital stay after operation is up to 7 days in LC (100%) and in OC (54.9%) and 45 % patient stayed more than 7 days in OC as shown in Table-18

FIGURE: - 18 -POST OPERATIVE HOSPITAL STAY

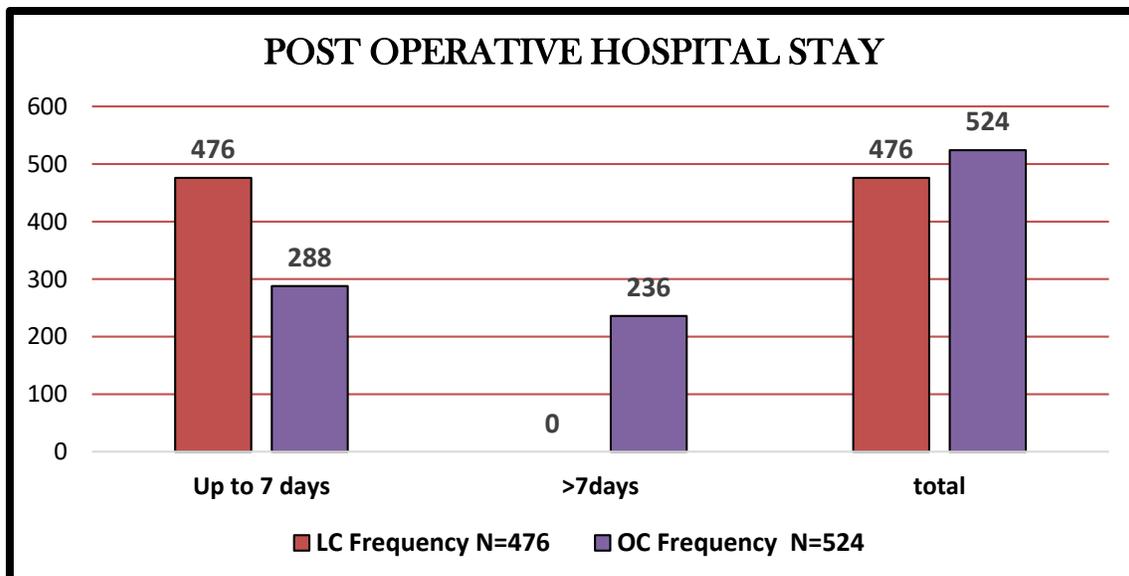


TABLE-19: LENGTH OF HOSPITAL STAY

Days (Range)	LC Frequency & % N=476	OC Frequency & % N=524	Total%	Z- Score	P-value
Up to 7 days	353(74.1%)	00	353(35.3%)	24.5074	<.00001
>7days	123(25.8%)	524(100%)	647(64.7%)		
TOTAL	476(100%)	524(100%)	1000(100%)		

The value of p is < .00001. The result is significant at p < .05.

FIGURE -19: TOTAL LENGTH OF HOSPITAL STAY

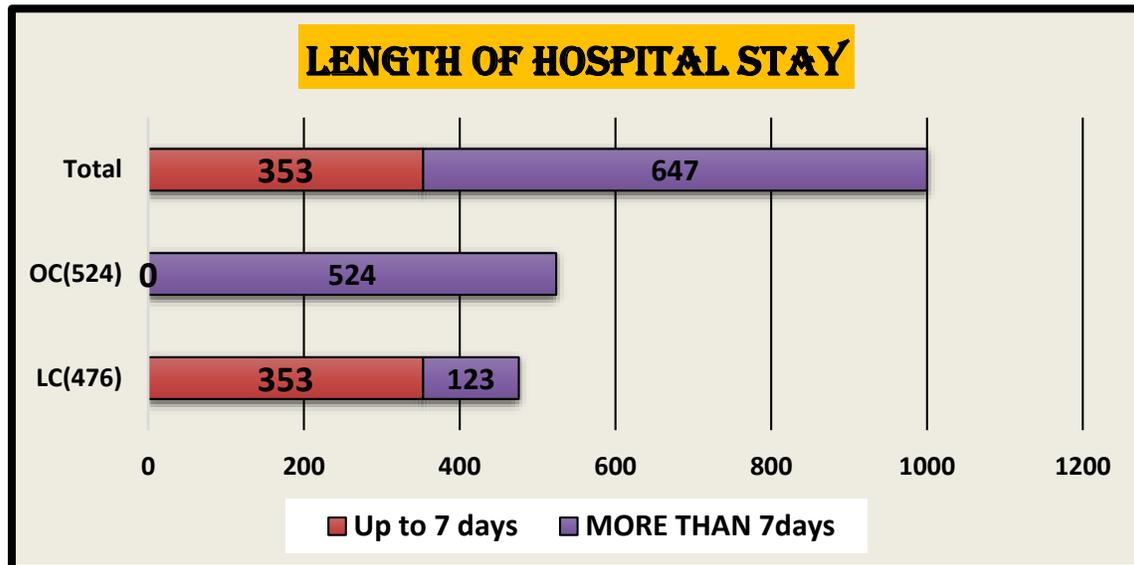


TABLE-19(A): AVERAGE LENGTH OF HOSPITAL STAY.

Operation	Mean days	SD	Minimum m	Maximum	Gr mean	Gr SD
LC	6.76	1.51	5	15	8.46	2.374
OC	10.01	1.918	8	31		

From the above table-19(A) depicted that the average length of hospital stay for cholecystectomy is 8.46 days with mean days 6.75 for LC and 10.01 for OC. Length of hospital stay is calculated from the day of admission to the day of discharge.

DISCUSSION

Carl Langenbuch, the pioneer of open cholecystectomy had very famously stated that “gall Bladder should be removed not because it contains stones, but because it forms them”³ “The purpose of both Open Cholecystectomy and Laparoscopic Cholecystectomy is to provide relief to the patient by safely removing the diseased gall bladder .

No age is said to be immune to gall bladder disease. The sex ratio found in this study was 12:13(48.2%:51.8%) in LC and 2:3(39.8%:60.2%) in OC group. however, sex ratio observed by Iqbal J⁴.et al in their study was 13.5:1 for OC and 10.19:1 for LC patients. The incidence of gall stone diseases increases after the age of 40 years and it becomes 4-10 times more common in old age. As many as 16% and 29% of women above the age of 40-49 years and 50-59 years respectively, had gall stone^{4,5}.In our study high incidence is seen in 3rd -4th decade with mean age 41.25 yrs in LC and 41.65yrs in OC group. Daradkeh⁵, Bigener et al⁶reported mean age 47.2 and 40 years respectively. Series by Thomas B Hugh et al ⁷, R Schmitz et al⁸ have reported a similar

peak incidence in the 4th and 5th decades. In contrast to our study high incidence has been shown by Rosen Muller. M et al⁹ years for OC and 54 years for LC group.

In the present study there was a female preponderance (56%) amongst the patients and majority of them were in 25-55years of age groups which are very much similar to those observed by Frazee et al¹⁰ and U. Berggren⁶ and Dr Arun Singh¹¹ (79%) female and 21% male out of 743 cases. These findings are consistent with results of similar studies.^{12,13}

Deb Barma D (2018)¹⁴ reported the peak incidence in 3rd and 4th decade followed by female preponderance (85%) female (15%) male. Findings were consistent with Singh P et al¹⁵ where 79% of cases are female age group of 41-60 years. Same high incidence has been shown in 3 to 5th decade by K. Altaf et al,¹⁶

Alok Chandra Prakash et a ¹⁵⁹ analyzed 180 patients with gallstones were most common in third and fourth decade with mean age being 38 years.

Food habits in the present study was found Mixed Diet (predominantly non-vegetarian diet). 952 samples were non

vegetarian from which 93% underwent LC and 97% underwent OC. Similar study was observed by Alok Chandra et al¹⁷ where 128 out of 180 patients consumed a mixed diet and the rest 52 out of 180 patients consumed a vegetarian. Non-vegetarians were found to be more commonly involved with cholelithiasis than vegetarians. Cholelithiasis is more in non-vegetarians, the cause could be due to the consumption of high protein and fat. The findings were similar with the findings in a study done by Maskey et al.¹⁸ in 1990 AD in Nepal where incidence of cholelithiasis was found more frequently among the people who consumed more fat and protein^{19,20} Several studies that have evaluated the role of diet as a potential risk factor for gallstone formation, including energy intake, cholesterol, fatty acids, fiber, carbohydrates, vitamins and minerals, and alcohol intake.²¹

Post-operative Pain is assessed with VAS. Pain course was experienced by both groups with variable intensity, Higher in OC as compared to LC. Pain is an inevitable outcome of any surgical procedure and early relief from pain is one of the primary goals of treatment. Early relief from post-operative pain was seen in group LC as compared to group OC patients in the present study. The VAS was significantly less for LC group as compared to OC. In the present study duration of postoperative pain score was 4.97 and 8.34 in group LC and OC group respectively. In a similar study by Shukla A et al²² duration of postoperative pain was 14.68 hours in LC Group and 27.92 hours in OC Group.

Kum²³ also found a mean VAS score of 3.8 v/s 7.7 between LC and OC. It was also demonstrated that patients undergoing open cholecystectomy required more analgesic than those undergoing laparoscopic cholecystectomy group especially when the patients develop wound infection.

LC is a minimally invasive procedure affecting limited tissue area and therefore reported lesser pain as compared to OC. Similar study by Mintu Mohan nandi et al²⁴ showed pain duration of 2 days for LC and 4 days in OC and duration of Analgesics used (mean 2 days for LC and 4 days for OC) also were significantly less in LC group.

A post-operative resumption of normal diet was possible within 2 days in LC while OC group required longer time. A similar finding was observed by Shukla A et al²² with mean time of 11.68 hours in LC Group and 17.24 hours in OC Group for restoration of oral feeds.

In present study post-operative wound infection was found in 3.3% patients in Group LAP and in Group OPEN wound infection was found in 6.8% patients. Siddiqui K et al²⁵ observed wound infection 2% and 6% respectively in laparoscopic cholecystectomy and open cholecystectomy group. The rate of surgical site infection was higher in OC (6.8%) as compared to LC (3.3%). Karim T et al²⁶ reported wound infection rate in open procedure to be 3 times the laparoscopic procedure. The above table showing studies with similar results as compared with the present study.

Wound infection in open procedure is 3 times the laparoscopic procedures. Jatzko et al²⁷ In their study observed that complications rate is lower in laparoscopic cholecystectomy group (0.3%) as compared to open cholecystectomy group (5.1%). Barkun JS et al²⁸. In a series it is observed that number of complications in laparoscopic cholecystectomy were significantly less than number of complications in open cholecystectomy. Siddiqui et al.²⁵ in their study observed that frequency of wound

infection was three times common in open cholecystectomy as compared to laparoscopic cholecystectomy in acute cholecystitis LC is associated with shorter hospital stay and quicker convalescence as compared to Classical OC. The Hospital stay in this study ranged from 3.97 days in OC and 7.66 Days in LC with mean length of hospitalization 3.97 days in LC and 7.66 days in OC.

In a study by Anmol N et al²⁹ the median duration of hospital stay was three days for LC and seven days for OC which is in accordance with our study. Among the 100 patients studied by Karim T et al²⁶, OC was associated with a mean post-operative hospital stay of 5.46 days, considerably greater than 3.7 days seen in patients undergoing LC group.

Nandi et al²⁴ also found similar results. Many publications have reported that LC is associated with shorter hospital stay.^{30,31}. In this series the average length of stay of 3.97 days for LC, versus 7.66 days for OC group .

Patient who underwent OC need antibiotics coverage for at least 3-4 days more than the patients who undergo LC according to Supe AN et al.³² Antibiotics requirements was found to be less in LC according to Foster D.S et al³³. In the present study all patients who underwent LC were given a mean days of (3.37) of antibiotics and OC. (6.19 Mean days)

In this study LC requires analgesics for shorter duration as compared to open because of smaller keyhole incisions thereby causing less pain in contrast to longer muscle cutting in open method. Similar findings were observed by Smith JF et al (1992)³⁴, and Trondsen et al (1993)³⁵.

In this studies early ambulation is seen in LC as compared to OC. Similar results has been found by Porte RJ³⁶, Shukla et al²².

In this series, there were no major complications and had several minor ones. There was no peri-operative mortality. Bile leak through drain tube in LC group was supposed to be from the gall bladder bed in liver due to minor injuries. All the patients were treated conservatively, drains were kept for a period of 2 days or more as the leak subsided. The main reason for blood loss in LC group was from the gall bladder bed which eventually stopped on conservative management.

From this study the following conclusion were drawn.

- The Mean Age in this series is 41.25 years in LC and is 41.65 years in OC.
- There was a female preponderance in both the groups with 51.8% of patients being female patients in LC and 60.2% patients being female in OC group .
- A total of 95.2% were non-vegetarian and this may be one of the main reasons for increasing number of GB stone diseases in Northeastern region, Assam.
- The level of patient satisfaction was very high in LC (27.73%) in comparison to OC (7.82%).
- Mean days of Antibiotic requirement is 3.37 days (LC) & 6.19 day(OC).

- Mean days for Analgesic requirement is 2.21 days (LC) & 3.6 days(OC).
- The Mean VAS score is 4.97 in LC and 8.14 in OC.
- Resumption of post operative diet (mean days) is 2.29 (LC) & 2.7(OC).
- The Post operative complication rate is 8.19% in LC and 17.9% in OC .
- The post operative Wound Infection is 3.3% in LC & 7.5%in OC.
- Mean days of hospital stay in LC is 6.76 and in OC group is 10.01days.
- The average ambulatory day is 2.26 in LC & 3.97 days in OC.

VI. CONCLUSION

The present study was carried out to assess the nursing perception regarding the effectiveness of treatment and outcome of LC and OC. Early post-operative recovery depends on educating patients on self-care, wound care and providing clear information in pre and post-operative and as well as before during and before discharge .

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Evaluation of Paud Learning in the Application of K13 with the Cipp Evaluation Model at Xaverius Kindergarten Ambon

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DOI: 10.29322/IJSRP.10.09.2020.p10554

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10554>

Abstract- The objectives of this study were 1) to determine the implementation of the eight national standard parameters of education at Xaverius Kindergarten Ambon based on the CIPP evaluation model and 2) how to evaluate the implementation of early childhood learning in the application of K13 at Xaverius Kindergarten Ambon. This research design is a descriptive research type, with a qualitative approach. This research variable is a single variable, namely the evaluation of PAUD learning in the application of K13 with the CIPP evaluation model. The research subjects were the principal and 6 teachers of Xaverius Kindergarten Ambon. The data collection techniques used was interviews, observation, and documentation study. The data analysis technique used in this study refers to the concept of Milles & Huberman, (1992: 20), which is an interactive model that classifies data analysis in four stages, namely data collection, data reduction, data presentation, and conclusion. The results showed: First, Xaverius Kindergarten Ambon already has an organizational structure and school work procedures that are described in job descriptions; Xaverius Kindergarten Ambon already has RENSTRA and RKT documents as well as a vision and mission that determines the school's policies and programs implemented with measurable performance criteria and standards; Xaverius Kindergarten Ambon already has a national curriculum document; RPPM and RPPH are references for teachers to carry out learning activities and Xaverius Kindergarten Ambon has achieved accreditation of an A rating. Second, Xaverius Kindergarten Ambon has a very ideal teacher to child ratio (1: 18.5). As many as 7 teachers (87%) qualify for S1 and only 1 person (12%) qualify for high school (while continuing studies at Terbuka University). Competence, the teachers are generally in the PAUD field; supported by work experience of most teachers 10 years and over. The trend of children's input and its population in the last 3 years has tended to decline, in line with the presence of 3 other superior kindergartens in Ambon City. Third, teachers at Xaverius Kindergarten Ambon in the learning process achieved a high Process score of 93%. Fourth, the output of Xaverius Kindergarten Ambon has good academic and non-academic achievements, for that Xaverius Kindergarten Ambon have high competitiveness to be accepted as one of the favourite

schools in Ambon City. This has given a positive image to parents and even the general public. Fifth, several weaknesses were found in the Process dimension: 1) the teacher had not conducted regular evaluations at the end of each discussion unit, there was a mismatch between the RPPH document and the questions and the teacher did not have a good understanding of authentic assessment; 2) there is any inconsistency between RPPH and the learning material presented by the teacher; 3) Teachers have not been able to use the K13 learning approach (scientific approach); 4) The ability to use APE, sometimes not according to the potential/talent, age, and level of child development.

Index Terms- About four key words or phrases in alphabetical order, separated by commas. Keywords are used to retrieve documents in an information system such as an online journal or a search engine. (Mention 4-5 keywords)

I. INTRODUCTION

The period of maturity of physical and psychic function in children is referred to as the sensitive period. In those days, the child had the ability to respond to the stimuli that occurred. The sensitivity of each child is certainly different, because the rapid development and growth is also different individually. This period is an important period as the basis for developing various abilities of children, among others; language, cognitive, motor and socio-emotional in children. In a child, there is a lot of potential to be developed. A child from an early age has certain characteristics that are distinctive and always passionate and passionate to explore his world (Riyati & Hasibuan, 2018). Children are individuals full of a million curiosity. Therefore, early childhood needs to be helped and accompanied in order to be able to grow optimally.

The government's efforts in supporting PAUD activities in Indonesia are very clear. One of them is, perfecting the curriculum. The Government of Indonesia has passed The Law of the Republic of Indonesia No. 20 of 2003 on the National Education system which states that the curriculum is a set of

plans and rules concerning the objectives, content and materials of lessons and how to use them to organize learning activities for educational purposes.

Suyadi means curriculum is a written text containing an explanation of every program in education in the school that should be done every year (Suyadi, 2011 p.78). For this reason, educational objectives are developed and prepared through the curriculum. To facilitate learning activities, the curriculum is used as a reference to organize it (Sukmadinata, 2015, p. 34). On the basis of some of the experts' opinions, it can be said that the curriculum is a plan device that contains rules or as a reference and guidelines for teachers in designing learning devices and implementing them in each learning activity.

Early childhood education (PAUD) is a basic education as a form of coaching effort stipulated for children, from the age of birth to the age of six that is carried out through the provision of educational stimuli so that the growth and physical and spiritual development of the child is more ready to enter further education formally, informally or informally. In line with this, it was further stated by Budiarti and Hasibuan (2016) that Early Childhood Education (PAUD) is the education of children aged zero to six years conducted by educators and parents in the process of care, parenting and education. Through the educational process, children can know and understand the learning experience gained from learning.

In line with this, Law No. 20 of 2003 on the National Education System Article 1 number 14 (in the Ministry of Education 2015, p.3) says that PAUD is a form of effort to nurture children from birth, until the child is six years old through the provision of educational stimuli in order to help the child grow, both physically and spiritually so that the child is really ready to enter the next level of education. Law in 2003 Section Seven of Early Childhood Education Article 28 (in Arifin 2014, p. 43), states that a) PAUD is an education carried out before the child enters the primary education level. b) PAUD pathways are implemented through formal, informal or informal education pathways. c) Kindergarten (Kindergarten), Raudhatul Athfal (RA), or other equivalent forms are forms of PAUD on formal education pathways. d) PAUD located in the path of nonformal education, namely; Play Group (KB), Day Care Park (TPA), or other equivalent forms. e) PAUD in informal education pathways, such as family education or education organized by the environment.

The 2013 curriculum in PAUD based on Permendikbud No. 146 of 2014 is a curriculum implemented by the government to replace the PAUD Operational Curriculum that has been in effect for approximately 6 years. Fadillah (2014, p. 16) states that the 2013 curriculum is an improved curriculum to balance soft skills and hard skills in the form of attitude, skills and knowledge. With

the 2013 PAUD Curriculum, it is expected that children can have improved attitude, skills and knowledge competencies and develop in accordance with the level of education that has been pursued, so that it will be able to influence and determine the success of the child. According to Sunardi and Sujadi (PLPG 2017, p. 10), K13 PAUD is a competency-based curriculum, because in its learning early childhood leads to the achievement of competencies of spiritual attitudes, social attitudes, knowledge, and skills involving six aspects of development in an integrated manner.

It is hoped that the implementation of this 2013 curriculum will be able to give maximum results to produce a good quality of education that is able to compete in the era of globalization today. This is possible because K13 is a curriculum that has many conceptual advantages based on character and competence that are realized to be so important today. Children are expected to be able to behave, knowledge and have skills in competing in today's era of globalization. This is one of the advantages of K13 from internal factors.

According to Wahyudin (2014, p. 5) child activity, holistic assessment, enforced character education, competency and needs conformity, and good evaluation system are some of the important things for the change and improvement of the curriculum. In addition, k13 externally has the advantage of preparing children to compete on the International scene with various other countries. In reality, many teachers are still not able to understand the intent and how to implement K13. As a result, the planning and evaluation did not occur to the maximum. It is well realized that without the ability and quality of good teachers, efforts to improve in the field of education are unlikely to succeed.

The essence of education is the learning process. Teachers are required to creatively create activities in learning (Riyati & Hasibuan, 2018). This will only work in the hands of qualified teachers. Teachers by various circles become the deciding instrument of children's learning success because it is the teacher who will transfer science and cultural value to the child. Gagne (in Setyosari, 2010) asserts that the teacher's duties in the learning process include designer, executor, and evaluator (p. 34). At that level, the successful implementation of K13 requires a professional teacher.

Professional coaching of teachers has been carried out by the government through policies of improving qualifications, certification and competency improvement through seminar forums, trainings and so on. However, in fact the ability of teachers has not improved relatively. This is in line with what FSGI Secretary General Satriwan Salim told *Republika Daily*, Wednesday, March 14, 2018. Satriwan Salim stated that certification has not been able to make a professional teacher, but

rather just pursue financial additions. Not only that, many problems arise in the field related to teacher competency.

For a long time, the competence of teachers in terms of teaching skills has not developed to the maximum, as stated by Jailani (2014). Just imagine, as reported by Kompasiana Daily online on November 28, 2017 that of the 3.9 million teachers present, there are still 25% of teachers who do not qualify for academic qualifications, and 52% of teachers do not have a professional certificate (Kompasiana.com, 2017). Maluku Province is one of the provinces whose teacher quality is relatively low. The Ministry of Education (2016) reported that from the test results UKG Maluku ranked second from below, with a score of 47.81 after the key position of North Maluku with a score of 45.34 (p. 22).

According to Totok Suprayitno (in Kompas 14 September 2018), who is the Head of research and development agency of the Ministry of Education and Culture that as for ukg results, nationally the average score is 53.02. This is below the minimum competency standard stipulated, which is 55.0. A total of 27 provinces have an average UKG yield score below minimum competency standards. There are only seven provinces with ukg results above standard, namely West Java, Bangka Belitung Islands, Bali, East Java, DKI Jakarta, Central Java, and DI Yogyakarta. Furthermore, Totok stated that based on the interim results of teacher competency test (UKA), a number of regions in Eastern Indonesia showed very low scores. These areas include Central Sumba, Papua, Morotai, Barito, Mentawai and Maluku.

Xaverius Ambon Kindergarten is one of the kindergartens in Ambon city that has achieved accreditation A. The kindergarten has implemented K13. Based on initial observations made by researchers in the field, teachers are still having problems implementing K13-based learning. From a recording of the results of an interview with one of the teachers, it was explained that the teachers felt the need to further improve their abilities, especially about the design of K13-based learning, so that teachers no longer had difficulty implementing it in learning.

The teacher stated that many k13 socializations are followed by teachers only for a moment. Socialization is also done in large groups without being followed by workshops on the preparation of learning devices and peer-teaching.

For this reason, the teacher felt the need to continue to add his skills and knowledge again, especially related to K13 PAUD learning

The information submitted by the informant is confirmed by the observation of the author in the class. When observing some teachers in the classroom while teaching, teachers are generally still the center of learning activities. Learning is done monotonously, namely lectures, singing, interspersed with play.

Rpph prepared by teachers, if observed does not include 6 basic abilities as mandated in Permendikbud No.137 of 2014 on the National Standard of Early Childhood Education which includes religious and moral values, physical-motor, cognitive, language, socio-emotional and art as a whole and holistically-integrative.

Teachers have not applied what is written in RPPH with activities in the classroom. Thus, RPPH appears to be a document prepared solely to meet formal-administrative requirements and has not become a formal guide to be applied in classroom learning activities. The results of the authors' observations, in line with move report conducted by BAN PAUD and PNF Maluku Province in 2019 on the performance of PAUD institutions after accreditation in 2018, as much as 60% of PAUD institutions in Maluku in an effort to improve teacher professionalism, accent is still on the compliance aspect and has not switched on performance aspect (p. 30).

The objective condition is inversely proportional to the spirit that the Government wants to develop through the K13 policy. Ideally the implementation of K13 in PAUD, implemented with a learning approach while playing, habituation and integrated thematic learning (in Mahmudah, 2016).

In that context, the authors will focus on the evaluation of PAUD learning in the implementation of K13 with cipp evaluation model at TK Xaverius Ambon. CIPP is the most widely known evaluation model applied by evaluators. The model was developed by Stufflebeam in 1967 at Ohio State University. This model emphasizes four things: Context evaluation; Input evaluation; Process evaluation; and Product evaluation (Arikunto.S., & Cepi. S.A., 2009, p. 27).

Experts have developed many models of evaluation of wearable programs. One of the most frequently used is the CIPP evaluation model. The CIPP model was developed by an expert named Stufflebeam who thought that evaluation had an important purpose not to prove but to improve (Stufflebeam, H.M., & McKee, B., 2003, p. 118). This evaluation model can be applied in all areas. Furthermore, according to Sudjana and Ibrahim (2009, p. 246) which translates each of these dimensions with the following meanings: a) Context (evaluation of context): planning of coaching programs influenced by situations or backgrounds. b) Input (evaluation of input): the achievement of the coaching program is supported by the quality of input. c) Process (evaluation of the process): what has been planned, starting from the implementation of the program and the use of customized facilities. d) Product (evaluation of results): the results achieved. The four words mentioned in the CIPP abbreviation are the target of evaluation, which is nothing but a component of the process of an activity program.

The following will be discussed the components or dimensions of the CIPP model which include; context, input,

process, product. a) Context Evaluation according to Stufflebeam (in Hamid, 2009) mentions, the main purpose of context evaluation is to know the cuts and weaknesses that evaluan has. By knowing these strengths and weaknesses, evaluators will be able to provide the necessary direction of improvement. According to Arikunto, S., & Cepi. S, (2009) that context evaluation is an attempt to describe and detail the environment of unmet needs, populations and samples served, and project objectives. b) Input Evaluation, which is the second stage of the CIPP model which widoyoko (2009) thinks that input evaluation helps to manage decisions, determines the sources that exist, what alternatives are taken, what plans and strategies to achieve the goals, and how procedures work to achieve them. Input evaluation components include: 1) Human resources, 2) Supporting facilities and equipment, 3) Funds or budgets, and 4) Various necessary procedures and rules.

According to Stufflebeam (in Arikunto., S., & Cepi, 2009) that questions related to input, leading to a problem solving that encouraged the program in question. c) Process Evaluation, according to Worthen & Sanders (in Widoyoko, 2009) that the evaluation process emphasizes on three objectives namely; 1) do detect or predict in procedural design or its implementation during implementation stage; 2) to provide information for programmed decision, and 3) to maintain a record of the procedure as it occurs. Evaluation processes are used to detect or predict the design of procedures or implementation designs during the implementation stage, providing information for program decisions and as records or archives of procedures that have occurred. The evaluation process includes a collection of assessment data that has been determined and applied in the practice of implementing the program. Basically, evaluate the process to find out to what extent the plan has been implemented and what components need to be improved. While according to Arikunto., S., & Cepi (2009), the evaluation of the process in the CIPP model refers to "what" (what) activities are carried out in the program, "who" (who) the person appointed in charge of the program, "when" (when) the activity will be completed.

In the CIPP model, the evaluation of the process is directed at how far the activities implemented in the program have been carried out according to the plan. d) Product Evaluation according to Sax (in Widoyoko, 2009), giving the understanding of product evaluation /results is "to allow to project director (or teacher) to make decision of program". From the evaluation process is expected to help project leaders or teachers to make decisions related to the continuation, end, or modification of the program. While according to Tayibnaxis (in Widoyoko, 2009) that the evaluation of the product to help make the next decision, both about the results that have been achieved and what is done after the program runs. From the above opinion, it can be concluded that the evaluation of the product is an assessment carried out in order to see the atability /success of a program in

achieving the previously determined goals. It is at this evaluation stage that an evaluator can determine or recommend to evaluan whether a program can be continued, developed/modified, or even discontinued.

To assess needs, issues, assets and opportunities, to help policymakers set goals and priorities, and to help other groups of users know the goals, opportunities and outcomes are context evaluations. Input evaluation is carried out to assess alternative approaches, action plans, staff plans and financing for the continuity of the program in meeting the needs of the target group as well as achieving the goals set. For this type of evaluation is very useful for those who make policies in selecting the design, form of financing, allocation of resources, executors and schedule of activities that best suit the needs. To assess the implementation of the plan that has been set up to assist the implementers in carrying out activities and then will be able to help other groups of users to know the performance of the program and estimate the results, then use process evaluation.

To identify and assess the results obtained, expected and unexpected, short-term and long-term, both for the implementers of the activities in order to focus on achieving the program goals and for other users in putting together efforts to meet the needs of the target group is the goal of the evaluation of the results (products). As for the division of this evaluation in an assessment of several related things; effectiveness, sustainability and transportability (Stufflebeam, D.L, 2003). Cipp (Context, Input, Process, and Product) models are one form of evaluation model performed in its entirety (all are one intact system).

This model is unique and has advantages located in decision-making devices related to the planning and operation of a program. The CIPP model will be explained in more detail as follows: 1) Context evaluation, including analysis of issues related to the program environment or objective conditions to be implemented. This evaluation provides an overview of the analysis of the strengths and weaknesses of a particular object. According to Stufflebeam that context evaluation is something important in identifying opportunities and assessing needs. A discrepancy view of reality with expected conditions (ideality) is a form of formulation of something that is actually expected or needed.

It can also be said that this evaluation relates to the analysis of what are the strengths and weaknesses of an object that is temporarily implemented. Context evaluation contributes in the form of information, especially for evaluators in planning a program to be done. Another point is to give a reasonable picture of a program. 2) Evaluation of inputs, including conducting personal analysis of how to use existing literature and the absence of alternative strategies that can also be used to achieve a program. See if, the system used is able to achieve the goal,

alternative strategies that can be used, how it costs and the right time for a program to be implemented.

In addition, input evaluation has the benefit of being a guide in choosing what program strategy is suitable in designing something as well as its procedures and rules. Through existing data and information, it can be determined what strategies are used within limitations. 3) Evaluation of the process is an evaluation that is designed and applied in the practice of activities directly, including how to identify problems that exist in all facets, both the planning, the process and the implementation of it. In each activity carried out, will be monitored honestly and thoroughly, any changes that occur. The various processes that occur will be recorded and recorded in detail, which is useful for future decision-making to determine the next best strategy.

Evaluation as a process of assessing something based on objective standards that have been set, then a decision is taken on the evaluated object (Djaali & Muljono, 2008, p. 45). According to Worthen & Sanders (in Sawitri, S., 2007, p. 24), the evaluation of the process aims to : a) Can be known what are the weaknesses during the implementation of this process, including anything good to maintain; b) Obtaining information about what the decision is; and c) Properly store defective recordings in the field concerning important matters during implementation; 4) A collection of descriptions and "judgment outcomes" in relation to context, input, and process, then interpreted the price and services provided is the evaluation of the product.

Product evaluation is an evaluation that measures the extent of the success of the goals achieved by containing various records about the achievement of the results and what is done for the improvement. Measuring and interpreting the results that have been achieved is a product evaluation activity. Measurements are developed and administered regularly and thoroughly. Accurate analysis will have an impact on the withdrawal of conclusions and submission of means in accordance with eligibility standards.

Broadly, product evaluation activities include setting the program's operational objectives, measuring criteria that have been achieved, comparing them between the field reality of the objective formulation, and compiling

rational interpretation. Analysis of this product is required comparison between the objectives set out in the design and the results of the program achieved. The results of this assessment can be test scores, percentages, observation data, data charts, sociometry and so on that can be spelled out with more detailed objectives. The rest will be qualitative analysis of how it can produce such a thing. What are the decisions taken from the implementation assessment at each stage of the evaluation of the program divided into 3 categories namely low, moderate, and high. The CIPP model is a decision-making-oriented model.

In this model, evaluation is divided into 4 kinds, namely: a) Context evaluation helps decision-making planning, formulates goals, determines the needs that will be achieved later; b) Evaluate input or input i.e., help, decision making, determine available resources, what alternatives are used, plans and strategies for achieving needs, and how to work to achieve those goals; c) Evaluation of the process, that is, helps to make decisions to the extent that the program has been implemented; d) Evaluate the product to re-evaluate the decision.

The CIPP model has the advantage of having a dynamic working system. Sukardi (2012, p. 63) states that the evaluation of cipp model outlines four kinds of decisions, namely: 1) The selection of general objectives and specific objectives is influenced by decision planning; 2) The decision or structuring is made, which is the optimal strategy used and the design of the process in order to achieve the objectives derived from the planning decided; 3) Implementation decisions that evaluators seek infrastructure to produce and improve decision-making, plans, methods, strategies to choose; and 4) Recycling decisions that determine, if a program is to be continued, then proceeded with modification, and or dismissed in total on the basis of existing terms.

According to Worthen (2001) that evaluators will not make strategic planning, because it is considered quite detrimental. The evaluation focuses on implementing four kinds of decisions divided into 4 sections, namely: 1) evaluation of context, information about what is needed to take precedence in order for the goal to be achieved; 2) input evaluation, the availability of information on what to do, where the advantages and weaknesses are, the strategy, and how to achieve the objectives; 3) evaluation of the process, the availability of information for the person tasked to evaluate in performing the monitoring procedure so that what is the excess can be utilized and its weaknesses can be eliminated; and 4) product evaluation, the availability of information that can be assured when a situation that makes a goal can be achieved and determine strategies related to the procedures and methods used to achieve the goal or vice versa (Sukardi, 2012, p. 64). The approach in the evaluation that is often used is an experimental approach, a goal-oriented approach, which

focusing on decisions, user-oriented and responsive approaches oriented towards success targets in evaluation.

The components in this education are interconnected with each other. PAUD in Indonesia is the same. In its current development, PAUD is quite important in children's education. According to an expert named Jalal (in Santoso, 2011, p. 218) that optimizing the development of children's brains is the goal of PAUD. Early childhood education covers the entire psychosocial

stimulus process of the child, so in designing his learning must be based on the ability, level of development, interest and needs of the child individually. The three core components of PAUD implementation are the determinants in the success of PAUD institutions according to Suyadi (2011, p. 224). The three components are input, process, and output. The input is child; a learning process that can run smoothly, effectively, and efficiently.

It takes many useful tools to support the implementation of the learning process according to the objectives that want to be achieved in the implementation of the learning process itself. The latter is, the output. Output is the impact of a process. The main input is the child. A human individual who consciously desires to develop his or her potential (physical and spiritual) through the process of teaching learning activities available at a certain level or level and type of education is the child himself. In education, children are the main object (central object), which is closely related to all activities in the educational process. Second, that is educators. An educator should be able to understand about the roles and tasks a child must accomplish in his or her growth as well as his learning. Educators are tasked with preparing learning resources in an effort to support the learning process.

According to Masitoh (2011, p. 43) planning is the beginning of a movement for a person to want to do something. There is an idea of what to do and how to do it for the purpose of achieving a planning goal. There is a concrete development of the curriculum in the form of a set of plans containing a number of learning experiences through play given to early childhood based on the potential and developmental tasks that must be mastered in order to achieve competencies that must be possessed by the child is basically PAUD learning activities (in Sujiono 2009, p.138). Previously the government has issued Permendikbud No.137 Year 2014 on PAUD standards, in order to answer this. PAUD is usually organized by drawing up a learning curriculum that is based on the regulation, to conform to the national standards that apply generally. The implementation of learning is a component of the process in question. Learning activities in order for children to be interested are considerations that must be considered, so an educator must establish a variety of learning methods. Various learning methods are applied to achieve goals or also referred to as learning strategies.

Application of a wide range of appropriate methods in learning with appropriate objective characteristics. There are several learning methods that can be applied in PAUD according to Isjoni (2009, p. 86), such as play methods, travel methods, conversation methods, storytelling methods, demonstration methods, and project methods. The last component is, the output and developmental aspect stipulated here in the form of learning objectives in the form of learning activities that children will do in one learning. Permendikbud No. 58 of 2009 states clearly

about the standard of child developmental attainment level consisting of NAM development, motor, cognitive, language, and socio-emotional.

In this study, the analysis was conducted using context, input, process, product (CIPP) models by taking into account all the learning components in PAUD. Based on Rogers' humanistic theory, behavior in PAUD refers to the development and awareness of his actualization needs. Man is a form of self concept and an experience that interprets it. Children also experience developments that include NAM development, cognitive, motor physique, emotional socio, and language in building their own perceptions. The final goal in PAUD is to achieve competency development according to their age through various stimuli. Stimuli can come from the environment and learning experience at this level as well as the positive influence on the child's own development.

This model was chosen by the author because it can direct its evaluation goal object to the process and input to the results. This model is rated very precise and suitable for use of course. The advantages of the CIPP model provide a comprehensive and in-depth evaluation format at each stage of the evaluation. The evaluation of this model is seen by the author as more effective, as it will dissect everything in detail. CIPP is an evaluation model that not only assesses but is also oriented towards improving the program. The results of the study, are expected to provide input to the PAUD institution for improvement in teacher performance in the future.

II. MATERIAL AND METHODS

Research Design

This research is a type of descriptive research with a qualitative approach. Descriptive research does not provide treatment, manipulation or alteration of free variables, but describes a condition as it is (Sukmadinata 2015, p. 73).

According to Bogdan & Taylor (in Moleong, 2014, p. 4) that qualitative research is a research procedure that produces descriptive data in the form of written or oral words from people and observed behaviors of the phenomenon. In addition, Moleong added (2014, p. 11) that descriptive research emphasizes data in the form of words, images, and not numbers. Focus and locus in this study: Evaluation of PAUD Learning in the Implementation of Curriculum 2013 with CIPP evaluation model in TK Xaverius Ambon.

Research Variables

This research variable is a single variable, namely the evaluation of PAUD learning in the implementation of K13 with cipp evaluation model. What is meant by the evaluation of

PAUD learning in the implementation of K13 in this study is a thorough assessment of the implementation of PAUD K13 learning using cipp evaluation model (Context, Input, Process and Output), then comparing it to the national standard of education. The next four dimensions of CIPP and its measurements are described as follows:

1. What is Context; namely the general evaluation of TK Xaverius Ambon related to the organization and work system and commitment to improve its quality and competitiveness. This dimension is measured by parameters/indicators: a) organization and work system; b) the vision and mission of the school; c) the process of drafting vision and mission; d) involvement of internal and external stakeholders; e) School planning; f) Curriculum K13; g) The level of teacher's understanding of K13; h) School accreditation rating and i) tips on maintaining and improving accreditation ratings.
2. Input, i.e. evaluation of various inputs that support processes and products. This dimension is measured by parameters/indicators: a) Teacher input, b) Teacher qualifications and competencies, c) certification, d) teacher's ability to prepare, PROSEM, RPPM and RPPH, e) Number of children, f) How the child population has been in the last 3 years.
3. What is process, namely evaluation of k13 learning implementation. This dimension is measured by parameters/indicators: a) Teacher's ability to open learning activities, b) Teacher's ability to use APE, c) The ability of teachers to use the K13 learning approach (Learning is carried out by learning while playing, integrative thematic learning process using scientific approach, habituation process implemented in learning); d) Teacher's ability to ask questions, e) Teacher's ability to master learning materials, f) Teacher's ability to motivate/strengthen and g) Teacher's ability to conduct authentic assessments in learning.
4. Product, namely evaluation of the implementation of learning results. This dimension is measured by parameters/indicators: a) Children's learning outcomes, b) the absorption of graduates in flagship schools, and c) parents' responses to children's learning outcomes.

Research Subjects

The subject of the study is basically the one that will be subject to the conclusion of the results of the study. The subject of the study is a source or informant who can provide information about the problems related to the research to be conducted. In qualitative research, research subjects are often also referred to as informants. Informants are people who are trusted as sources or sources of information by researchers who will provide accurate information to complete the research data. In line with this, Sugiyono (2016, p.216) states that informants are a reference for samples from qualitative research. The sample in the qualitative study was not named by the respondent,

but as a source, or participant, informant, friend and teacher in the study. The informant provides the data or information required by the researcher. Without an informant, researchers would not have gotten the results or the core of a study. In this study, the subjects of the study were the Principal and 6 teachers of Xaverius Ambon Kindergarten.

Data Source

According to Riduwan (2013, p. 69) the data source is described into 2 sections namely, 1) how to capture data collected directly by researchers (directly to the Subject) referred to as the primary data source, 2) if the way data is retrieved through the second hand (through reports, or files and documentation studies) or also called secondary data sources. Based on this opinion, the authors will collect two types of data, namely primary and secondary data.

Data Collection Techniques

The data collection techniques used include:

1. Interview
Interviews are used to collect data related to the 4 dimensions of this research, namely Context, Input, Process and Product. The informants to be interviewed are the Head of Xaverius Ambon Kindergarten and 6 teachers of Xaverius Ambon Kindergarten. Interview guidelines are designed based on the issues reviewed and the theories that in this case are based on the opinions of the experts who have been reviewed and then developed in the statement items.
2. Observation Techniques
The observation implementation aims to observe the implementation of learning in accordance with K13 in the classroom, at Xaverius Ambon Kindergarten. The observation will use an observation sheet. The observation sheet is equipped with 5 scores. Scores that move from numbers 1 to 5. The dimensions and indicators that will be revealed using observation guidelines, namely the dimensions of the process. The number of subjects to be observed is 3 people.
3. Study Documentation
Study documentation is used to obtain supporting data from participants. Documents to be obtained from the study documentation include: school organizational structure, vision and mission, planning documents, teacher qualifications and competencies, K13 document data (PROSEM, RPPM, RPPH), authentic assessment documents, absorption data/study results, data on the absorption of graduates in superior/favorite elementary schools and parental satisfaction levels.

Validity of Data

To test the validity of the data obtained so that it is completely in accordance with the purpose and intent of the

study, the researchers used triangulation techniques. Data triangulation according to Moleong (2012, p. 330) is a data checking technique by utilizing something else outside of the data, for the purposes of checking or as a comparison of the data. The triangulation used in this study is triangulation with sources and methods, which means comparing and checking the degree of trust of an information obtained through different times and tools in qualitative methods. Triangulation is performed by the author in the following ways:

1. Compare the observation data with the interview results data.
2. Compare what people say in public with what they say in private.
3. Compare one's circumstances and perspectives with the various opinions and views of others, such as someone higher educated or an expert in the field being researched.

Data Analysis Techniques

The data analysis technique used in this study refers to the concept of Miles & Huberman (in Ilyas, 2016, p.94) which is an interactive model that classifies data analysis in four stages, namely:

1. Data Collection
Data obtained from interviews, observations, participatory observations and documentation studies are recorded in field records consisting of two parts namely, descriptive and reflective. 1) Descriptive notes are natural records in which they contain what researchers see, hear, witness and experience without the researcher's opinion and interpretation of the phenomenon. 2) Reflective notes are records that contain the impressions, comments, opinions, and interpretations of researchers about the findings encountered and are the material of the data collection plan for the next stage.
2. Data Reduction
Once the data is collected, further reducing the data, in order to select relevant and meaningful data, focus the data that leads to solving problems, discoveries, meanings or to answer research questions. It then simplifies and systematically organizes and describes the important things about the findings and their meanings. In the data reduction process, only data findings or findings related to research issues are reduced.
Meanwhile, data unrelated to research problems will be discarded. In other words, data reduction is used for sharpening, classifying, directing and discarding insane, as well as organizing data, making it easier for researchers to draw conclusions.
3. Data Presentation
Presentation of data can be in the form of writings or words, images, charts and tables. The purpose of the data feed is to combine the information, so that it can describe the circumstances that occurred. In this case, in order for researchers to have no difficulty in mastering information

either overall or certain parts of the study results, then researchers must create narratives, matrices or graphs to facilitate the mastery of such information or data.

Thus, researchers can still master the data and not draw monotonous information conclusions. This is because scattered and poorly composed data can influence researchers in acting unwisely and drawing impartial, concised and unscinged conclusions. For data display to be realized as part of data analysis.

Withdrawal of Conclusions

The withdrawal of conclusions is carried out during the research process, as is the process of reducing the data, after the data is collected sufficiently adequately, then a temporary conclusion is drawn, and once the data is completely complete, the final conclusion is drawn.

IV. DISCUSSION

Research Site Description

Xaverius Ambon Kindergarten is an early childhood education institution established on September 1, 1952, led by donesia sisters from the Netherlands. This educational institution is located under the auspices of Asti Dharma Foundation located at Jalan Pattimura No. 15 Ambon. Xaverius kindergarten was established to contribute to the world of early childhood education in ambon city which was still very minimal. The existence of TK Xaverius at that time, answering the needs of the people in Ambon City who are eager to have education for early childhood. Its strategic location in ambon city center, so that the community flocks to send their children to Xaverius Ambon Kindergarten. First opened, TK Xaverius has about 300 students. Furthermore, TK Xaverius Ambon experienced considerable development, both quantity and quality as evidenced by the proud achievements of its children, both academic and non-academic and became one of the favorite kindergartens in Ambon city.

In the next development to date, TK Xaverius has undergone five changes of Principal, and currently TK Xaverius is led by Klara Lamere's mother, SPd. Yayasan Asti Dharma continues to strive to improve the quality and quality of education services for early childhood in Xaverius Kindergarten by adding service programs that are playing groups for children aged three to four years, as well as providing extracurricular lessons for kindergarten students such as religious lessons , English, computer and music arts. TK Xaverius is also believed to be the core school for kindergarten schools in Sirimau sub-district as well as the IGTKI secretariat of Maluku Province, so although there are currently many PAUD schools in Ambon city, TK Xaverius is still the choice of ambon city community.

Description of Context (Context)

Context description, covering the organizational structure and working system of the school, the vision and mission following the drafting process, stakeholder engagement, school planning, applicable curriculum, availability of K13 documents, teacher level of understanding of K13, accreditation rating and school tips maintain the school accreditation rating. These parameters will be further described.

TK Xaverius has a clear school organizational structure. According to K.A.'s recognition that the structure and working system of TK Xaverius as a whole is governed by the Foundation and cooperates with principals and teachers (Results of The Interview with K.A. Dated September 23, 2019). Based on observations and document studies, the authors found that the school's organizational structure was equipped with job descriptions, ranging from principals, teachers and education personnel. The author's interview with several informants, obtained information that the Principal has implemented a description of the task according to the structure of the school organization so that all personnel play an optimum role. Based on the study documentation, the authors found that TK Xaverius already has school planning documents, namely strategic plans or medium-term planning documents and operational planning documents (RENOP) or annual work plans (CTR).

According to the teachers in the kindergarten, there is an annual plan made in the medium and short term programs drawn up by the teachers in the school. The planning is done, some are not; everything is adjusted according to the conditions. For example, some time ago there was a tour program for children to visit funworld in the mall, but everything was constrained by the prolonged earthquake of the past few months". The work program in this school is organized every year and everything is run according to the plan, except because of the natural conditions (earthquakes) a few months ago even to date so there are some programs that can not be implemented.

TK Xaverius has implemented the 2013 curriculum. Based on the speech of several teachers who suggested that the School has permendikbud document 137 Year 2014 on National Standards of Early Childhood Education and Permendikbud 146 year 2014 on Curriculum 2013 Early Childhood Education. The level of understanding of the teacher is tapped K13, generally not good. This is acknowledged by one of the teachers as follows: So far everything is going well. However, teachers are a bit troubled by the guidebooks brought to school. So, most children have not been able to complete the tasks that teachers give through the teaching book. Broadly, this kindergarten teacher's understanding of K13 has not been so masterful because teachers have a bit of difficulty with the curriculum that is constantly changing without giving us the opportunity to learn well, so still need to continue to learn and get mentoring specifically related to this K13.

TK Xaverius Ambon has reached accreditation rating A. Therefore, the school has tips for maintaining the school accreditation rating. The results of interviews with teachers suggest that teachers learn more of course to develop themselves. Further to improve the professional skills of teachers, supervision of the Principal and also supervision. The Foundation is implemented separately. The schedule is 2 months, once every 3 months or at most 4 months.

All the average teachers often participate in training, especially those carried out by IGTKI. IGTKI always regularly conducts joint learning activities between kindergarten teachers. Further confirmation with the Principal on tips on maintaining the principal's recognized accreditation rating is carried out through increased teacher capacity and supervision activities. Furthermore, the principal's description is as follows: As the Principal, I feel that the a accreditation homework is both a pride and a challenge. Get an A rating, through a hard struggle. So, I am committed to maintaining it with 2 focuses. Strengthening teacher capacity; I did through teacher delivery to participate in various trainings both local and national, seminars and improving teacher qualifications to S1 PAUD. The second focus is through classroom supervision activities. Supervision of my class is done regularly in the hope of observing the teacher in the implementation of learning using K13. Teacher deficiencies and weaknesses in learning, I note for correction and coaching actions" (Principal, September 25, 2019).

The results of the interview with the principal when confirmed with the study documentation, accordingly. For example, the author found several local HIGH SCHOOL certificates followed by teachers. However, training conducted by the school and the Foundation does not exist. The principal's supervision is done because it is recorded in the supervising book. However, the book that records the principal's supervision activities is not fully filled. In a review of the supervision book, the authors found that the existing records were only the date of the visit while the observed and reverse issues given at the end of the visit were not written.

According to one of the teachers suggested that in order to maintain the accreditation of the school, all returned to the teacher. Teachers need to work harder and develop schools in terms of learning and there needs to be good cooperation between teachers, with children and also with parents and foundations. Not to forget, the school in this case teachers need a lot of experience from other schools that get good accreditation as well.

Constation is really reasoned because of the good or bad of an education system that is supported by good policy supported by the provision of the following infrastructure, funds, community support and good governance, ultimately returned to

teachers. Teachers become the deciding act of a successful education policy or not in a practical state because it is the teacher operational cast that translates various education policies in concrete form to students in the classroom.

Input Description

Input description, includes: number of teachers, qualifications and competencies, number of certifications, ability to compile PROSEM, RPPM and RPPH, number of children and population trends in the last 3 years. These parameters will be further described. The number of teachers working at TK Xaverius is 8 people. Of these, 8 teachers have s1 PAUD qualifications. Of the 8 teachers, only one (Principal) is civil servant and has been certified while the other 7 teachers have not been certified. The seven teachers are appointed by the Foundation. In addition to 8 teachers, based on documentation studies, TK Xaverius also has 1 education personnel (computer personnel).

Based on the results of interviews with teachers, information obtained that: all teachers are PAUD scholars, only 1 person in A2 class is still in high school, but while continuing his undergraduate studies paud at UT. All teachers have not been certified, except the Principal. There have been many activities that teachers participate in, for example some time ago there were paud learning activities based on Mother Language by the Provincial Government and so on. Not only teachers but also the Foundation even that often participates in activities, especially activities outside the area. Furthermore, he explained that in this School, for the creation of RPPM, teachers work together in schools and RPPH is composed by each class teacher".

The teacher's description corresponds to the study documentation that the author did. Based on the document study, the authors found that paud learning training activities based on The Mother Language conducted by the Maluku Provincial Government, followed by 2 teachers were proven by certificate of participation. The author did not find the PROMES document while the RPPM and RPPH documents were indeed available, but they were incomplete. According to the teacher's confession, the school, RPPM and RPPH are made by the teachers themselves together. The mechanism is divided, so the total number of teachers is 8 people, divided into 4 teachers who are semester 1 and 4 other teachers do semester 2 for us to use together later. It is similarly recognized by other teachers as follows: In this school, for the manufacture of RPPM and RPPH made by the teachers themselves together in the teacher's room. The mechanism is divided, so the total number of teachers is 8 people, divided into 4 teachers who are semester 1 and 4 other teachers do semester 2 for us to use together later. In preparing APE also always work together.

The results of interviews with other teachers on the reasons why the school does not yet have promes documents, it is acknowledged that the school does not yet have them. The school does not yet have a complete curriculum document. Curriculum documents both KTSP and K13 we download documents issued by the Ministry of Education. The Curriculum of the Institute is not yet ours. PROMES we haven't had time to arrange. Rppm and RPPH we have but not yet complete. The problem is because of the time constraints that we have so that the documents are not fully arranged. One of the requirements to be able to teach is that teachers must show RPPM and RPPH at the Principal's desk to be examined and signed, only then can teachers start with learning activities in the classroom. This means that teachers have been able to compose rppm and rpph independently.

This data provides accurate information that TK Xaverius only has curriculum documents obtained online; does not have PROMES; and does not have complete RPPM and RPPH documents. This is due to time constraints, so teachers are more focused on pursuing curriculum achievement targets.

The last input parameters are student input and population trends. According to teachers in kindergarten, the number of children who are kindergarten Xaverius is currently 148 children divided into 7 classes and so far the population of children entering this kindergarten is decreasing. Usually the number of children who enter this kindergarten is on average 100 closer to 200 children per year, where 1 class is placed in the 30s with 1 teacher alone because if made 2 shifts also teachers can not afford because of course teachers tend to be more energy for it.

The description of the teacher corresponds to the results of the study documentation that the authors did. According to the document study, the trend of the child population in Xaverius kindergarten from year to year continues to decline. The downward trend if digested is not on the problem of losing competition but rather due to the presence of Ciputra Kindergarten, Lentera Kindergarten and Caritas Kindergarten. With the presence of the three new schools, some children, especially those who live close to the location of the school, chose to study at the three schools.

the number of children and population trends in Xaverius Kindergarten over the past three years (period, 2017-2019), tend to decrease. In aggregate, over the last 3 years the number of inputs of 507 children. Of these, 250 boys and girls had 256 children. In 2019, there were 148 children with details: 84 men and 64 women. According to the principal's description, the number of children as many as 148 people is divided into 7 classes. Thus, the average child in each class is 21 children.

Based on the number of children in 7 classes, when associated with the ratio of teachers is still considered ideal (1:18,5).

Process Description

The description of the process includes: the teacher's ability to open learning activities, the ability of teachers to use APE, the ability of teachers to use the K13 learning approach, the teacher's ability to ask questions, the teacher's ability to master learning materials, the ability of teachers to motivate/strengthen and the ability of teachers to evaluate learning using authentic assessment techniques.

According to the teacher in the kindergarten, the teachers always try to ask fellow teachers one school friend or another friend who is from another school or also through the organization IGTKI. So they can share with each other in every regular meeting. The teacher used the APE based on the RKH that day. So, everything is tailored to the availability of existing APE. If it is not available, then the teacher provides other alternatives that are roughly similar to those needed to learn, for example learning about turtles because there is nothing original, then we use the image that the teacher himself prepared to use to learn. Teachers also always try to ask fellow school teachers and other friends who are from other schools or also through IGTKI organizations, so they can share with each other in every regular meeting. On average, all teachers have been able to master the learning materials well. Usually the Teacher gives invitation, hug, spirit, praise to the child who finally convinces the child that the child is able to work and so on. Usually the teacher will make a learning evaluation every day. From what happens in the classroom to the child, so through it, the teacher will get an idea, which child can already and which child still needs mentoring and guidance again and of course the teacher will always try to help the child be able to with good development.

It is similarly acknowledged by other teachers that, overall, all teachers have been able to open lessons well because teachers here have been trained for how to open lessons. So the way all teachers open lessons is uniform (the same). The ability of teachers to use APE is good, because usually for teachers in this kindergarten, the day before learning, the teachers always together prepare all the needs for learning the next day. The teacher always tries to ask his fellow school teacher friends in the teacher's room when he finishes learning and usually the teacher searching on the internet. On average, all teachers have been able to master the learning materials well. The ability of teachers in this case is undoubtedly because the experience of teaching teachers in kindergarten is not 1-2 years, but it has been a dozen even decades. The motivation and reinforcement is usually done by the teacher at the beginning, the core of the learning, can even at the time of closing the learning. Usually the teacher will assess

through the package book used for the child every day after the child completes the task given by the teacher. This assessment in kindergarten uses anecdotal notes, diaries and observations.

Overall, all teachers have been able to open lessons well because teachers here have teaching time that is not 1 or 2 years but 10 years and above, so that is enough if only to open one lesson. Teachers have been able to use APE, because it is already the daily food of a teacher in kindergarten. Talking about K13 is still quite difficult and quite dizzying for teachers because K13 is so complex and so many aspects. However, however it is the demands of the curriculum today, so whatever happens, teachers should understand it well. For this, it takes time for teachers to constantly learn it again. Teachers always try to ask fellow school teachers and fellow paid groupmates. On average, all teachers have been able to master the learning materials well, because in this kindergarten a week before the teacher has to prepare everything first in the control of the Principal. This is very important for the child. The teacher will see based on the child's condition. However, the average teacher has been able to even always motivate her children in learning. Usually in this school, once a week we have an evaluation between the Principal and the teachers of the class even we engage IGTKI to be with us to solve the problem that exists or just to share the knowledge only.

Based on participatory observations, the authors found that teachers use tools or materials to play while learning by utilizing the wealth that exists around the child. Teachers have set a good example or not of doing something bad to the children in the classroom. The teacher was friendly and had a cheap smile. Teachers have been trying to find solutions when dealing with problems (e.g. limited APE, limited playing field). The teacher has been fair to his students despite the differences in gender, ethnic, religious, physical condition, and socioeconomic status of his family. Teachers have utilized/empowered local wisdom to support their learning process (e.g. utilizing local arts, local traditional games, people's livelihoods, local natural conditions in the learning process).

Based on the results of data analysis and interview results with informants, against 7 dimensions of the process studied overall, teachers 93%, have had good skills. Some drawbacks that need attention:

1. Evaluation of learning, i.e. teachers have not evaluated regularly at the end of each unit of language, the discrepancy of RPPH documents with the problem and the teacher has not had a good understanding of the authentic assessment;
2. The ability to master learning materials, there is still a weakness that there are inconsistencies between RPPH and learning materials reviewed by teachers;

3. The ability of teachers to use the K13 learning approach still found weaknesses that the use of learning approaches sometimes does not correspond to RPPH documents and teachers sometimes still find it difficult to apply scientific approaches;
4. The ability to use APE, it is still found that APE sometimes does not match the potential/ talent, age and level of development of the child.

Product

Analysis of product dimensions, namely children's learning outcomes in school, the absorption of graduates in favorite schools and parents' responses to children's abilities; it was found that Xaverius Ambon kindergarten graduates have good academic and non-academic achievements so they have high competitiveness to be accepted at favorite schools in Ambon City. It gives a positive image to parents even the community. As many as 60% of Xaverius kindergarten graduates, received at SD Xaverius C (superior grade elementary school), another 40% are accepted at Lentera Elementary School, Kalam Kudus Christian Elementary School, SD Teladan and other favorite elementary schools in Ambon City.

Through the documentation study, the authors found that holistic integrative services have been performed such as: weight weighing, height, head circumference measurement, dental and gum care (in partnership with PUSKESMAS). However, parenting services such as consultations, parent engagement in the classroom and home visits have not been implemented. In addition, schools and parents have not used connecting books to report on children's development. The results of this study are in line with the research of BAN PAUD and PNF Maluku Province.

Integrative holistic services at PAUD Institutions, still supported. All stakeholders are involved in child services. Based on the results of accreditation in 2019, for education services: some teachers have not been able to use learning models that stimulate children to play; teachers do not yet have a good understanding of the scientific approach; six aspects of child development have not been able to be implemented by teachers simultaneously in learning; there is still a strong tendency that teachers are more active than students; lectures became a very dominant method used by teachers.

Character culture, still instructive for example do not do this, do so and so and teachers have not been able to build through habituation and firsthand experience. Nutrition and care health services: conducted regularly in partnership with PUSKESMAS. The service still focuses on head circumference measurement, weight weighing, height and dental and gum care; health care information to parents is less than once done.

However, the administration is not well organized. Parenting services: Consultation, Parent engagement in the classroom and home visits have not been implemented. In addition, schools and parents have not used connecting books to report on children's development. Protection services: has been implemented properly with safe infrastructure, facilities and toys (BAN PAUD AND PNF Maluku Province 2019).

Therefore, integrative holistic services include: Education services, nutrition and care services, parenting services, and protection services need to be considered seius by Xaverius Ambon Kindergarten. Integrative holistic services enable agencies to establish partnerships with external stakeholders such as: Parents, PUSKESMAS, Police and other agencies.

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IV. CONCLUSION

Based on the results of data analysis and discussion can be drawn some conclusions as follows:

1. First, kindergarten has an organizational structure and school work system described in the description of duties and manifested in the granting of authority and responsibility so that all personnel move in support of the achievement of the organization's goals; TK Xaverius already has RENSTRA and CTR documents and a vision and mission that determines school policies and programs implemented with measurable performance criteria and standards; already has a national curriculum document; RPPM and RPPH, which are referenced by teachers, have achieved the accreditation rating of A. Tips by the school to maintain the school accreditation rating, namely through strengthening teacher capacity and academic supervision (classroom visits).
2. Secondly, TK Xaverius Ambon has an ideal teacher-to-child ratio (1:18.5). Teacher 7 (87%) qualified S1 and only 1

person (12%) high school qualifications (while studying further at UT). Competence, teachers are generally paid; supported by the work experience of most teachers 10 years and older; The trend of child input and population in the last 3 years, tends to decrease, along with the presence of 3 superior kindergartens, namely Lentera Kindergarten, Ciputra Kindergarten and Caritas Kindergarten in Ambon; so that some children, especially those who whose residence is adjacent to the location of the school that recently chose to study in the 3 schools.

3. Third, teachers at TK Xaverius in the learning process achieved a high Process score of 93%; Teachers use tools or materials to play while learning by utilizing the wealth that exists around the child, providing a good example to the children in the classroom, being friendly, trying to find solutions when facing problems, being fair to the children, regardless of gender, tribe, religion, physical condition, and socioeconomic status of the family. Teachers have leveraged/empowered local wisdom to support their learning process.
4. Fourth, Xaverius Ambon kindergarten output has good academic and non-academic performance so they have high competitiveness to be accepted at favorite schools in Ambon City. This has given a positive image to parents and even the general public.
5. Fifth, some of the weaknesses found in the Process dimension: 1) the teacher has not evaluated regularly at the end of each unit of the language, there is a discrepancy in rpph documents with the problem and the teacher does not yet have a good understanding of the authentic assessment; 2) there are inconsistencies between RPPH and learning materials reviewed by teachers; 3) Teachers have not been able to use the K13 learning approach (scientific approach); 4) Ability to use APE, sometimes not as appropriate as the potential/ talent, age and level of development of the child.

The increase in teacher capacity related to K13 with the focus of learning strategies and models, the use of age-appropriate APE and child development and outenthic assessments need to be considered by the school in the form of traning and improving the frequency and intensity of academic supervision; To improve quality and competitiveness especially facing new competitors TK Xaverius needs to establish partnerships with external stakeholders, in program design, implementation and evaluation together so that there is a good sense of trust and image that has implications for input support, assistance personnel, infrastructure facilities and fund support. TK Xaverius is expected to immediately complete all curriculum documents (PROMES, RPPM and RPPH) and apply them consistently according to the age and level of development of the child.

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Investigating The Potential Use of Tuff Aggregates to Produce Lightweight Concrete

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DOI: 10.29322/IJSRP.10.09.2020.p10555

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10555>

Abstract- Sources of conventional concrete materials such as gravel, granite and limestone rocks are becoming scarce due to overexploitation as Kenya strives to industrialize posing great risks on their availability as well as sustainability. This research sought to assess the feasibility and suitability of tuff aggregates for the production of structural lightweight concrete. Normal-weight concrete (NWC) samples made from granite aggregates were used as control in the experiment. The main primary properties of study and comparison for the two types of concrete were the unit weights and compressive strengths. The mix design process was done according to ACI 211.2-98 Code. The workability of fresh concrete was tested according to BS EN 12350-2. The average slump value of tuff concrete mixed with water-cement ratio of 0.4 was 12 mm while that of conventional concrete was 27 mm. The unit weights of tuff and conventional concretes were determined according to ASTM C138. The results suggest average 28-day dry densities of 2038 kg/m³ and 2527 kg/m³ for tuff and conventional concretes respectively. The compressive strength tests were performed at different ages of concrete in accordance with BS 1881-part 116. In particular, the 28-day compressive strengths of 26.0MPa and 30.0MPa were obtained for tuff and conventional concretes respectively when presoaked aggregates were used with water-cement ratio of 0.4. However, an increase in the 28-day compressive strength of tuff concrete up to 25.5MPa while a decline in the compressive strength of conventional concrete up to 20.4MPa were noted at water-cement ratio of 0.6 when oven dry aggregates were used. The results of unit weights and compressive strengths from this study confirmed the concrete produced from tuff aggregates as a lightweight structural concrete as per Euro Code 2. The study further confirmed tuff aggregates to be suitable materials for the production of lightweight structural concrete which can be recommended for high-rise buildings and long-span bridges.

Index Terms- Compressive Strength, Lightweight Concrete, Normal-weight Concrete, Tuff Aggregates, Unit Weight.

I. INTRODUCTION

A lightweight structural concrete can be defined as a concrete having a 28-day air dry density of not more than 2200 kg/m³ and a compressive strength of at least 17 MPa as per Euro code 2 [22] whereas a normal-weight concrete (NWC) density ranges from 2200 kg/m³ to 2600 kg/m³ [13]. Due to its high density, the conventional concrete becomes a structurally inefficient material for a number of applications such as high-rise buildings and long span bridges. Many attempts have therefore been made to reduce the self-weight of concrete thus increasing its structural efficiency. Minimal research has been done in which the properties of tuff and normal-weight concrete have been compared despite substantial tuff deposits being found across many parts of Kenya including Bahati and Kedowa areas of Rift Valley Province where volcanic eruptions are known to have been prevalent. Tuff is a type of extrusive igneous rock that is formed from the products of an explosive volcanic eruption [9]. Tuff rocks in Kenya are mainly used to produce dimension stones for walling in buildings and erection of perimeter walls. However, expanded polystyrene wall panels are slowly being embraced by designers and builders to replace the use of tuff rock dimension stones in the building industry.

Two classifications of lightweight aggregates (LWA) include natural and artificial aggregates. The natural lightweight aggregates (NLWA) are produced by crushing volcanic natural rocks while the artificial lightweight aggregates (ALWA) are produced by expanding materials such as perlite, clay, shale, slate and vermiculite through heating in a rotary kiln. Lightweight aggregate concretes (LWAC) are produced by using porous aggregates with a specific gravity lower than 2.6 [11]. The production of artificial lightweight aggregates is a very costly process requiring a lot of energy for heating the aggregates. Similarly, the production of conventional aggregates is an expensive process which contributes to the destruction of roads during transportation as well as an increase in carbon emissions due to heavy crushing and blasting operations at quarry sites. Increased construction activities in Kenya has put conventional materials for making concrete at risks of depletion. An investigation on the use of natural tuff aggregates to make lightweight concrete, therefore,

becomes relevant. The current research sought to investigate and assess the suitability of tuff aggregates for the production of a low-density concrete while comparing its properties with those of conventional concrete. This study explored the performance of LWAC incorporating tuff coarse aggregates while comparing its properties with those of normal-weight concrete made using granite aggregates. Other than increased structural efficiency, up to 489 kg/m³ by weight of concrete reduction in structures can be achieved if tuff concrete is used instead of normal-weight concrete according to the current research. This translates into a reduction of 19.0% weight of structures constructed with tuff concrete compared with similar structures done with conventional concrete. In the rush to meet the Millennium Development Goals (MDGs) and the Vision 2030 [12], the Kenyan government has initiated a number of flagship projects which have increased the consumption of cement from a low of 154,781 tonnes in January 2005 to a high of 564,000 tonnes in January 2017 [14]. Consequently, the consumption of conventional coarse aggregates was estimated to have increased from 619,124 tonnes to 2,256,000 tonnes in the same year. This necessitates the investigation of alternative materials to avert early depletion of conventional materials.

II. MATERIALS AND EXPERIMENTAL PROGRAM

The borrow site for tuff aggregate material was in Bahati area in Nakuru County, Kenya. Nakuru County is in Rift Valley Province located between longitudes 35°28' and 35° East and Latitude 0°13' and 10°10' South at an altitude of about 1912 meters above the sea level. Masonry blocks are normally extracted from tuff rock deposits for constructing walls of buildings in the area. The borrow site for the conventional aggregate material was Ongata Rongai quarry located in Kajiado County, Kenya. Kajiado is situated 17 km south of Nairobi Central Business District at an altitude of 1,731 above the sea level. Fine aggregate for the study was river sand obtained from Kajiado river beds. Kajiado is a town in Kajiado County, located 80 km south of Nairobi, along the Nairobi – Arusha Highway. The samples were collected using gunny bags and taken to the University of Nairobi laboratory for storage, analysis, and testing. Figure 2.1 shows a sample of sand harvested from Kajiado river which was used as fine aggregate. Figures 2.2 and 2.3 show sampled tuff aggregate borrow site and tuff aggregate in Bahati area. Tuff rock formation in the area is found at an average depth of 1.5m beneath the ground level and extends several kilometers in the area of coverage. Figures 2.4 and 2.5 show the borrow site and a sample of conventional aggregate material respectively found in Ongata Rongai in Kajiado county. The materials used to produce tuff concrete include; water, Type 1 cement, sand, and crushed coarse tuff aggregate while conventional concrete was prepared for control experiment using crushed granite aggregates, water, Type 1 cement and sand. Commercially available polycarboxylic ether based superplasticizer complying with requirements of ASTM C-494 Type F and G [4] was incorporated into concrete mixtures. Potable water was obtained from the University of Nairobi laboratory for mixing and curing of concrete. Ordinary Portland cement with class strength of 32.5N complying with EN 197 Standards [7] was used for this investigation



Figure 2.1: A sample of sand used as fine aggregate



Figure 2.2: Tuff aggregate heap and borrow site in Bahati quarry



Figure 2.3: A sample of tuff aggregates from Bahati quarry



Figure 2.4: Conventional aggregate borrow site from Ongata Rongai



Figure 2.5: A sample of conventional aggregates from Ongata Rongai quarry

The process of grading the aggregates and determination of physical properties such as bulk densities and specific gravities were done according to BS EN 882 [19]. Concrete mix design process for tuff and normal-weight concrete was done according to ACI 211.2 Code [1] while targeting 28-day compressive strengths of 25 N/mm² with w/c ratio of 0.4. Batching was done by weight of constituent materials to give a unit volume of concrete. The density of tuff fresh concrete was estimated from the constituent mix materials to be 1974.2 kg/m³. This density is less than the maximum density of LWC of 2200 kg/m³ as defined by Euro Code 2 [22]. The density of fresh normal-weight concrete was estimated to be 2453.2 kg/m³ from the combination of the constituent mix materials according to

Table (1) below. The mix proportions for tuff aggregate concrete by weight were determined to be 1: 2.3: 2.2 representing cement, sand and tuff aggregates respectively. The corresponding mixture proportions for the conventional concrete were 1: 2.3: 3.7 by weight of the cement, sand and granite aggregates respectively in a concrete mixture. Coarse aggregates of tuff and granite materials occupying the same volume of about 63% in a unit volume of concrete but having different weights gave the above mix proportion. The mixtures were prepared based on a water-cement ratio of 0.4 to produce a unit volume of concrete as per their respective weights according to the table below.

Table 1: Concrete mix proportions targeting concrete grade M25 to give 1m³ of concrete

Type of concrete	Tuff concrete	Granite concrete
Mixing water for concrete	133kg/m ³	133kg/m ³
Cement content	333kg/m ³	333kg/m ³
Fine aggregate content	768kg/m ³	768kg/m ³
Coarse aggregate content	740kg/m ³	1219kg/m ³
Air content	2%	2%
Water-cement ratio	0.40	0.40

The workability tests were performed according to BS EN 12350-2 [8]. The effects of superplasticizer (SP) on the workability of concrete mixtures were investigated by varying the SP dosages from 0%, 0.5%, 1.0%, 1.5%, 2.0% and 2.5% by weight of cement while keeping the water-cement ratios constant at 0.4. In the experiment, presoaked aggregates were used for the concrete mixtures in order to ensure minimal absorption of both water and the superplasticizer by dry aggregates especially the tuff aggregates. The compaction factor test for concrete was conducted in accordance with BS EN 12350-2 [8]. The densities of NWC and LWAC in fresh states were measured in accordance with ASTM C138/C138M-16a [5]. The average unit weights of concretes were measured at the ages of 14 and 28 days according to ASTM C642 [6]. The compressive cube strength tests were carried out according to BS 1881: Part 116 [17] at the ages of 7, 14, 21, 28, 35 and 42 days. Although 35 and 42 day strengths are not common, this study sought to assess the influence of internal curing on compressive strength of concrete in service. The strength to weight ratio of concretes were also determined and compared at the age of 28 days. The 28-day splitting tensile strengths of concretes specimens were determined and compared having been prepared from the concretes samples based on w/c of 0.4 without adding superplasticizer. The tuff aggregates were presoaked before mixing to ensure minimal absorption of mixing water. Three concrete cylinder specimens cast from each type of concrete on 150 mm diameter x 300 mm long moulds were investigated for 28-day splitting tensile strengths. The tensile strengths were determined according to equation (1) below which was formulated by Timoshenko and Goodier [21].

$$\sigma_x = \frac{2P}{\pi LD} \tag{1}$$

Where;

σ_x ; represents the splitting tensile strength, MPa or N/mm²

P; is the maximum applied point load, N

L; is the length of the specimen, mm

D; is the diameter of the specimen, mm

III. RESULTS AND DISCUSSIONS

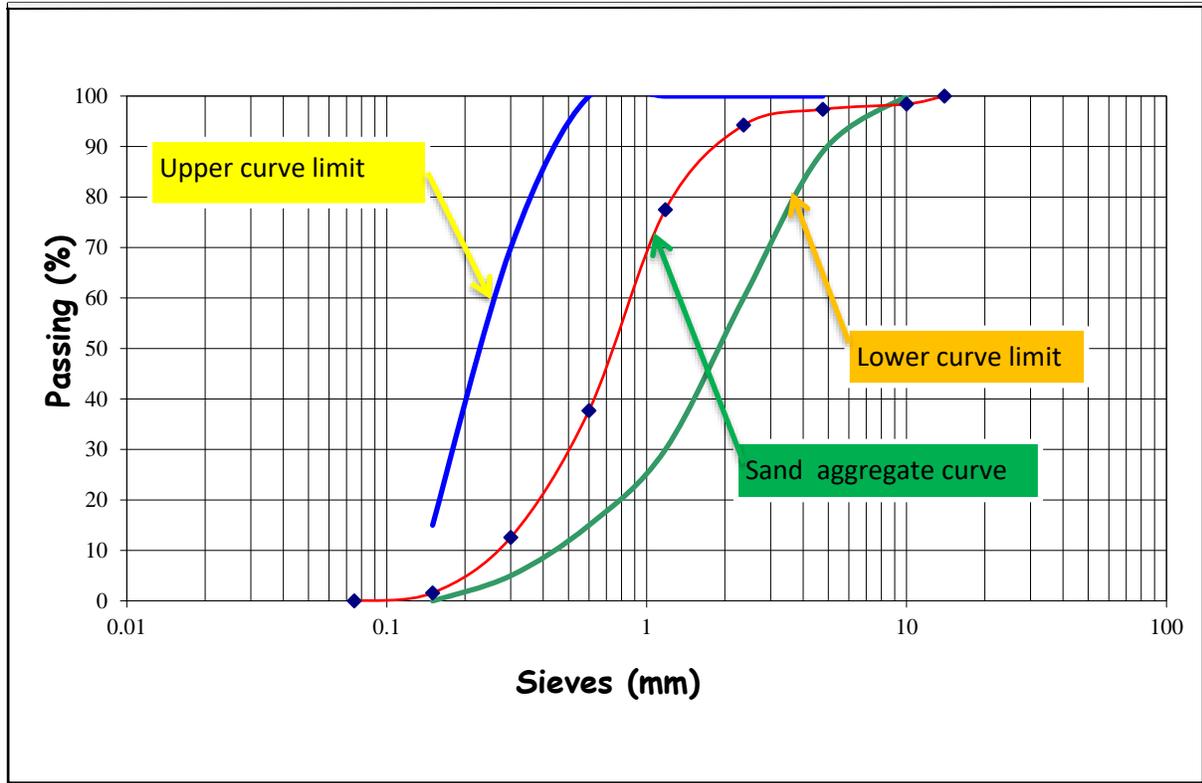


Figure 3.10: Grading limits for Sand

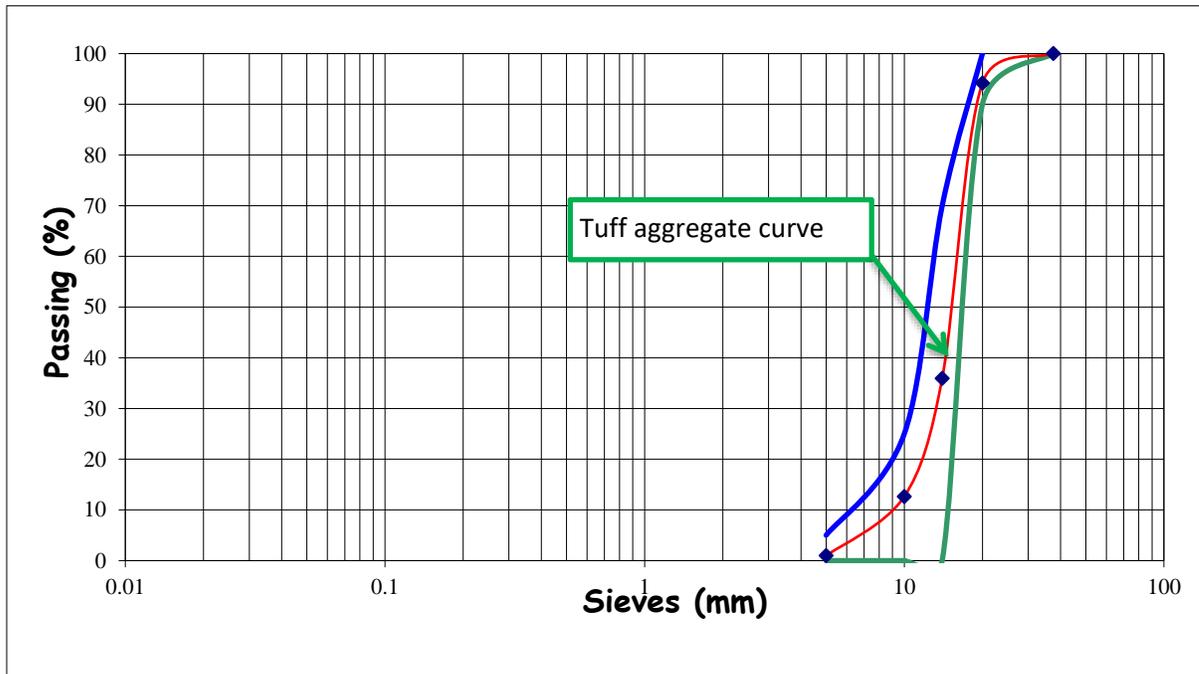


Figure 3.11: Grading curve for tuff aggregate from Bahati area in Nakuru

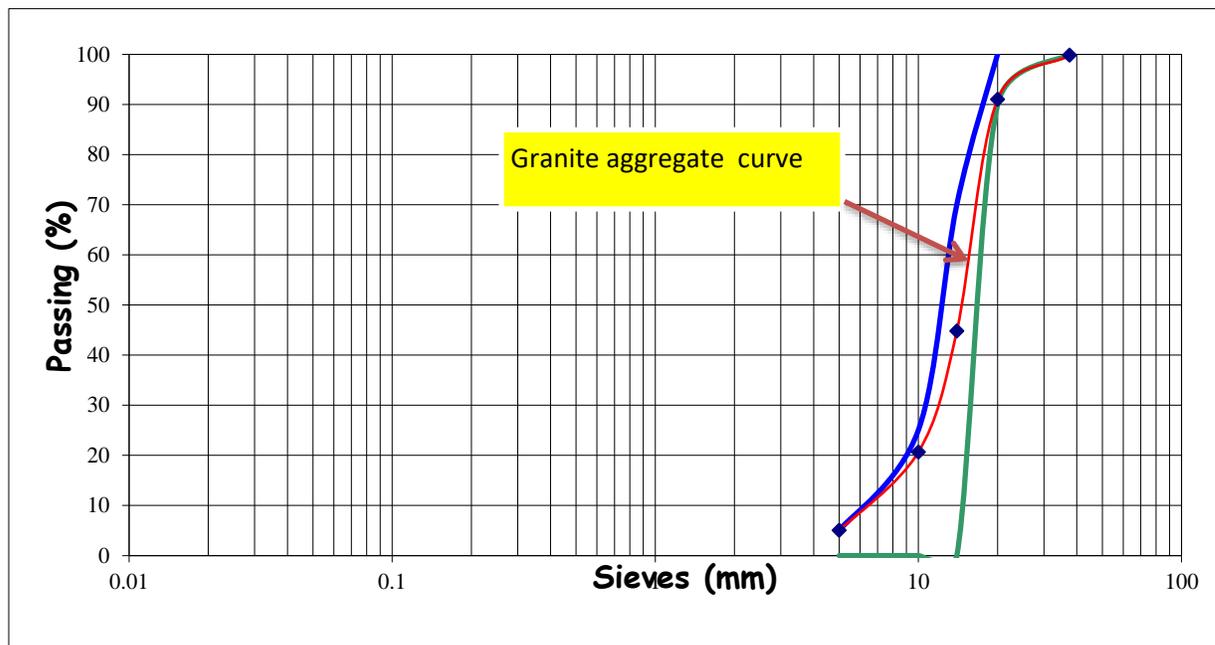


Figure 3.12: Grading curve for coarse granite from Birika in Kajiado County

As shown in the Figures 3.10, 3.11 and 3.12 above, the gradation for the sand, tuff and granite aggregates were found to fall within the acceptable limits of the BS 812-103.1 [18]. The effective sizes of the particle size distribution (PSD) (D_{10}), (D_{30}) and (D_{60}) passing were 0.27 mm, 0.50 mm, and 0.90 mm respectively for fine aggregates. The fine aggregate belonged to zone-II. Similarly, the effective sizes (D_{10}), (D_{30}) and (D_{60}) passing were 7.0 mm, 10.10 mm and 10.50 mm respectively for tuff coarse aggregates. The effective size (D_{10}), (D_{30}), and (D_{60}) passing were 6.0 mm, 10.10 mm, and 10.70 mm respectively for normal coarse granite aggregates. The coefficients of uniformity, C_u , given by the ratio of (D_{60}) to (D_{10}) for fine, tuff, and granite aggregates were determined to be 3.3, 1.5, and 1.8 respectively. The coefficients of curvature, C_c , calculated from equation (2) below, were found to be 1.02, 1.38, and 1.6 for sand, tuff and granite aggregates respectively. These results were checked against AASHTO classification which provides that C_u should be greater than 4, i.e. $C_u > 4$ while C_c should be greater than 1 but less than 3, i.e. $1 < C_c < 3$ for aggregates to be considered well-graded. It follows therefore, all the aggregates being lower than 4 were not well graded but uniformly graded. This means the cement paste and fine aggregate required to fill the void spaces between aggregates in the mix were more in quantity increasing the cost of producing the concretes than the case would be if the aggregates were well-graded. The amount of cement and fine aggregate also has an effect on the unit weight and the compressive strength of the hardened concrete.

Well-graded aggregates enhance the workability, placement, degree of compaction, and durability of concrete. In contrast, aggregates that are poorly graded result in underfilling of voids in particles resulting in entrapped air and can negatively affect the workability and strength concrete. A concrete made from poorly graded materials does not protect the reinforcement from corrosion due to possible leakages. The coefficient of curvature, C_c , of aggregate is given by equation (2) below;

$$\text{Coefficient of curvature, } C_c = \frac{((D_{30})^2)}{(D_{10})(D_{60})} \quad (2)$$

Where;

D_{10} is the effective size of particle size distribution at 10%

D_{30} is the effective size of particle size distribution at 30%

D_{60} is the effective size of particle size distribution at 60%

Table 2: Physical Characteristics of Aggregates and Cement

Type of concrete	Tuff concrete	Granite concrete
Coarse aggregate maximum size	20.0mm	20.0mm
Dry rodded unit weight of aggregate	1180kg/m ³	1600kg/m ³
The specific gravity of OD coarse aggregate	1.55	2.65
The specific gravity of SSD coarse aggregate	1.89	2.66
Flakiness Index of aggregate	20%	31%
Elongation Index of aggregate	15%	22%
Coarse aggregates water absorption	21.9%	0.25%
The specific gravity of fine aggregates	2.63	2.63
The specific gravity of Portland cement	3.15	3.15
Maximum size of fine aggregates	5mm	5mm
Fineness modulus of sand	2.7	2.7

Table 2 above presents the physical properties of constituent materials of concretes. The fineness modulus of the sand was found to be 2.70. A fineness modulus of 2.70 indicates that the sand was of medium-range and zone-II. It was not too fine nor too coarse. A medium-range sand has fineness modulus ranging from 2.6 – 2.9. Fineness modulus values in the range of 2.40 to 3.00 are common in Portland cement concrete (PCC) mixtures. A fineness modulus value of 2.7 is fairly good for workability and finishing of concrete. It is important for good texture and finishes in concrete works.

The specific gravity (SG) of a substance is a measure of its density. Samples of tuff and granite aggregates gave average specific gravities of 1.55 and 2.65 respectively. The low specific gravity noted for tuff aggregates is attributed to higher internal porous microstructure for the aggregates compared with granite aggregates. A lower specific gravity of tuff aggregates indicates that these aggregates are more porous due to the presence of air voids. Conversely, a higher value of specific gravity for granite aggregate means higher values of abrasion and attrition necessary to withstand extreme exposure conditions of weather. The specific gravity of aggregate affects the proportioning of concrete materials as given in ACI 211.2-98 [1] when carrying out mixed designs.



Figure 3.13: A sample of saturated surface dried tuff aggregate

Figure 3.13 shows a sample of tuff aggregates being surface dried after presoaking to saturated surface dry (SSD) condition to determine and compare its water absorption with that of conventional aggregates. After presoaking, the specific gravity of tuff aggregates improved from 1.55 to 1.89 while that of conventional concrete increased from 2.65 to 2.66. The tuff aggregates were found to have gained on average a weight by 21.9% while granite samples weight increased on average by 0.25%. From the results of water absorption, tuff aggregates were found to absorb more water than granite aggregates due to the presence of numerous larger size of pores within their cellular structure. The crystal structures forming granite rocks are tightly interlocked leaving tiny pore spaces to store water. The absorption capacity and rate of absorption are especially important for mixed design calculations to correctly establish the water-cement ratio which controls the workability, strength and permeability characteristics of concrete. Due to the high water absorption by tuff aggregates, the actual and effective water-cement ratio required to produce good workability mix is usually lowered resulting in slump loss during mixing. Many factors affect the actual water-cement ratio of lightweight concrete mixtures. The most important ones include; water absorption, the state of moisture content, and the amount of porous aggregate in a concrete mix. The reduction of water-cement ratio in fresh concrete is usually considered a negative phenomenon that can lead to loss of concrete workability. Therefore, tuff aggregates require high water-cement ratio to produce a workable mix than conventional concrete. Its therefore recommendable to presoak these aggregates before they can be used to produce a lightweight concrete mix with good workability.

BS 812: Part 105 [18] classifies aggregates as flaky when they have a thickness of less than 0.6 of their mean sieve sizes, while aggregate particles with the greatest dimension of more than 1.8 of their mean sieve size are classified as elongated. From Table 2 above, tuff aggregates and the granites had flakiness indices of 20% and 31% respectively. This means conventional aggregates require more fines, cement and water to make a good quality concrete compared with tuff aggregate concrete. This would lead to an increase in the cost of production of conventional concrete than tuff concrete. The elongation indices obtained for tuff aggregate and granite were 15% and 22% respectively. Flaky and elongated aggregates have larger surface areas which resulted in higher demand for cement paste in the concrete mix. This means granite aggregates require more cement to produce a good concrete mix than a similar concrete made from tuff aggregates. BS 882 [19] specifies an upper limit of 50% for uncrushed gravels and 40% for crushed gravel. The shape of aggregate particles influences water absorption, paste demand, placement characteristics such as workability, strength, void content, packing density, and cost as observed by Rached et al. [15].

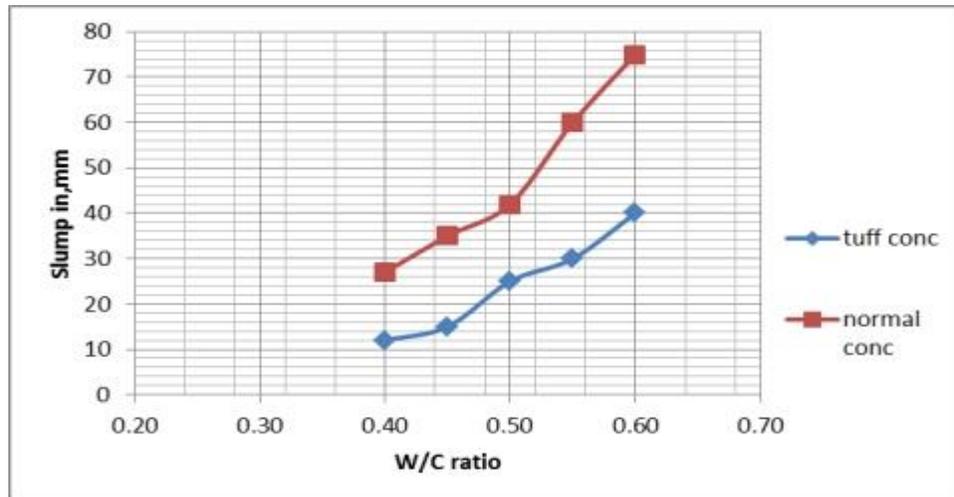


Figure 3.14: Effect of w/c ratio on the slump of the concrete mix

From Figure 3.14 above, the workability of both tuff and granite concrete was enhanced when the w/c ratio in the mix was increased. However, conventional concrete displayed a higher workability than tuff concrete for a given water-cement ratio. This is because tuff aggregates absorbed more water leaving little water for hydration of cement paste and lubrication of aggregates resulting in lower slumps. However, the slump values of both concrete samples were noted to increase with an increase in the mixing water. In the current research, the cement content was kept constant while varying the water content throughout all the mixtures. The aggregates were kept dry before mixing. From the results, a tuff concrete sample mix with a w/c ratio of 0.4 produced a slump value of 12 mm while normal-weight concrete had a slump of 27 mm. A tuff concrete sample with a w/c ratio of 0.4 could not mix thoroughly well as more water was absorbed by porous aggregates making the mixing process difficult and resulting in the harsh concrete with a low consistency. As a result of the inadequate free water, the cement particles failed to fully dissolve and interact with tuff aggregates when the w/c was 0.4 resulting in a low workability mix. It was noted that an increase in w/c ratio from 0.55 to 0.60 produced a slump of 40 mm from 30 mm while normal-weight concrete produced a slump of 75 mm from 60 mm. The increase in the slump of normal-weight concrete was higher as seen in the slope of the curve especially when w/c ratio was increased from 0.5 to 0.6. Increasing w/c ratio to 0.55 resulted in slump values of 30 mm and 60 mm for tuff and normal-weight concrete respectively. A water-cement ratio of 0.6 resulted in slump values of 40 mm and 70 mm for tuff and granite concrete respectively. The normal-weight concrete produced medium workability mixes when mix with w/c ratio of 0.5 and 0.6. Medium workability mixes have slumps in the range of 50mm to 90mm. Tuff concretes produced low workability mixes. Low workability mixes have slumps ranging from 10mm to 40mm. Slump values of tuff aggregate concrete were generally lower than those of normal-weight concrete because tuff aggregates absorbed more water into the pores leaving little water necessary for increased workability of the concrete. The water which was to cause an increase in the slump of tuff concrete was absorbed by the aggregates contributing to slump loss. Subsequently, there was a reduction of tuff concrete workability, unlike granite concrete where the effective free water for workability remains unabsorbed.

However, too much water in the mix resulted in the segregation of concrete. Too much water is therefore not recommended as it reduces the compaction of concrete and increases the chances of concrete bleeding and segregation. This results in the formation of voids and the reduction in strength of the hardened concrete. The segregation occurs when the sand and coarse aggregate components settle at the bottom while the cement paste forms at the top of the concrete mass. Slump values from 25 mm to 75 mm are normally specified for concretes used for floor slabs according to ACI 211.2-98 [1] where the compaction of concrete is necessary.

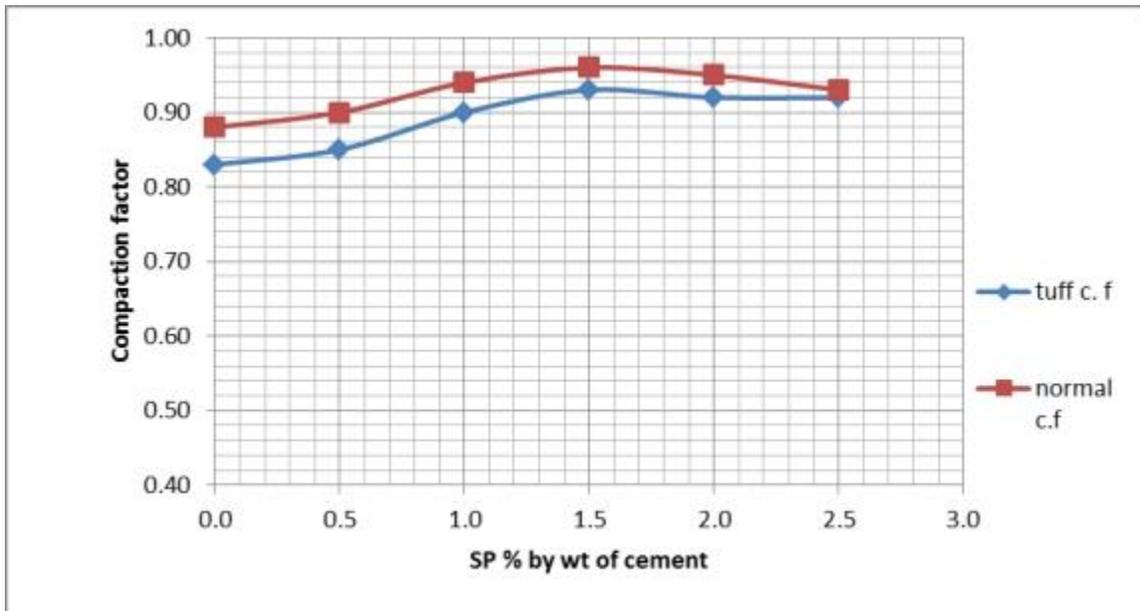


Figure 3.15: Effect of Superplasticizer on compaction of concrete (w/c 0.4)

From Figure 3.15 above, the compaction factors for both concrete samples improved generally when dosages of superplasticizer were increased in the mixes. The aggregates used for this test were presoaked before mixing to minimize the absorption of water and the superplasticizer, particularly by the tuff aggregates. The compaction factors for tuff concrete were noted to increase at a higher rate than those of granite concrete as the superplasticizer dosage was increased. This was seen as the gap between the two curves reduced gradually until the two curves were close. While the compaction factors increased from 0.88 to 0.96 for normal-weight concrete with superplasticizer dosage of 0% to 1.5%, the compaction factors increased from 0.83 to 0.93 for tuff concrete. The reason for the increase in compaction of the two concretes is that the superplasticizer helped disperse more cement particles to form cement paste which expelled entrapped air from the concretes. The cement paste and the aggregates interlocked after entrapped air was expelled from the voids in the process of compaction producing denser concretes. The compaction of tuff concrete seemed to improve at higher rate as the superplasticizer dosage was increased from 1.0% to 1.5% suggesting that more entrapped air in the concrete was being expelled from the concrete refilling the voids with the cement paste. However, when 2.0% of superplasticizer was added to the mix, the compaction of tuff concrete reduced to 0.92 while that of granite concrete dropped to 0.95. At 2.5% superplasticizer dosage, the compaction of tuff concrete slightly increased to 0.93 while that of granite concrete reduced to 0.93. From these results, an economical optimal percentage dosage of 1.5% to achieve high compaction factors to save on power and cost during mixing and placing can be recommended for the two types of concrete. Since tuff concrete contains air in the pores and between the particles, the superplasticizer forces more films of water and cement paste to expel the air from the pores and fill the void spaces in the aggregates causing an increase in compaction. However, the compaction of both concrete mixes declined when more superplasticizer dosage was increased from 1.5% to 2.5% while keeping the w/c ratio constant. That means more free water was left in the mixes causing segregation and bleeding of concretes and a decline in the compaction factors were noted. However, the compaction of normal-weight concrete was better than tuff concrete due to higher bulk density of granite aggregates than tuff aggregates in the mixes. Optimum superplasticizer dosage of 1.5% is therefore recommended for tuff and normal-weight concrete to achieve high compaction factors of 0.93 and 0.96 respectively.

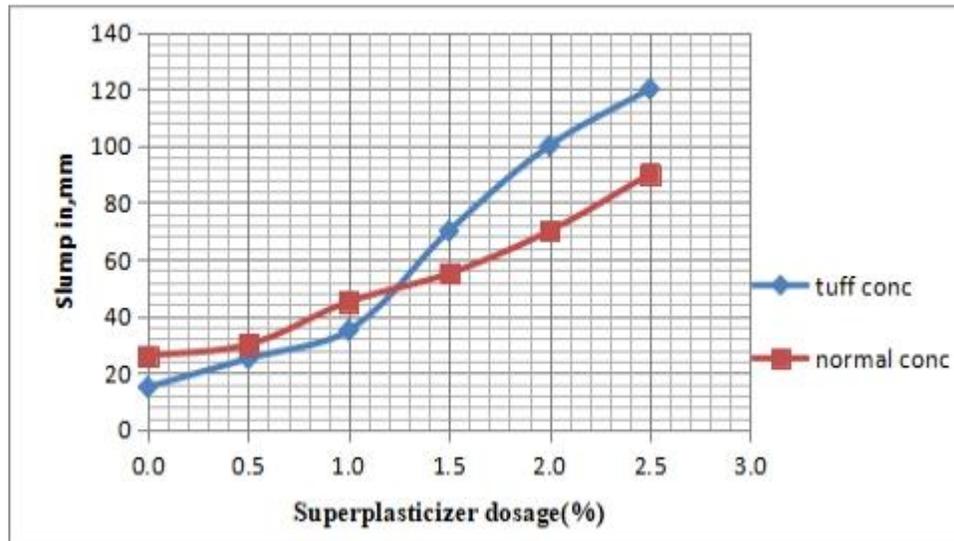


Figure 3.16: Effect of superplasticizer on the slump of concrete having w/c ratio of 0.4

From the results in Table 3.16 above, the concrete samples having water-cement ratio of 0.4 without super plasticizer were observed to have low slumps of 15 mm and 26 mm for tuff and normal-weight concrete respectively. The tuff aggregate samples in the mix absorb more water into the pores of the aggregates leaving little water for mixing and production of a cement paste available to coat the surfaces of aggregates and fill the voids thus making the concrete stiff within a few minutes of mixing. Unlike the tuff aggregates, a small amount of water is absorbed by the conventional aggregates leaving a high amount of water for the hydration of the cement paste responsible for filling the voids and lubrication of the aggregates leading improved slump in the concrete. Superplasticizer causes a transformation of stiff, low-slump concrete into flowing, pourable, and easily placed concrete. When 0.5% superplasticizer dose was added, the slump of tuff concrete increased by 67% to 25 mm while that of normal-weight concrete increased by 15% to 30 mm closing the gap difference at a slump value of 50 mm corresponding to 1.2% superplasticizer in the mixtures. Most of the tuff aggregates could possibly still absorb more water which contributed to lower slumps of tuff concrete than conventional concrete. On reaching a 1.2% superplasticizer dosage addition, the aggregates were possibly wet enough and fully saturated to absorb more water and the superplasticizer. The superplasticizer was increasingly becoming effective in the dispersal and de-flocculation of cement particles by creating like charges on the solid surfaces of the cement particles increasing the concentration of cement paste responsible for the lubrication of aggregates causing an increase in the workability of tuff concrete. The increase in workability of tuff concrete was more rapid surpassing that of normal-weight concrete when the superplasticizer dosage was increased from 1.5% to 2.5%. The gap between the two curves widened with the slump values increasing from 70 mm to 120 mm for tuff aggregate concrete while normal-weight concrete recorded a medium workability slump ranging from 55 mm to 90 mm. At 2.0% dosage, the tuff concrete mix became a high workability mix with a slump exceeding 100mm. This concrete is suitable for use where there is a tight spacing of reinforcement in a concrete structure where vibration of concrete is difficult. On the other hand, the addition of 2.0% superplasticizer dosage increased the slump of normal-weight concrete into a medium workability mix with a slump of 70mm. A medium workability mix has a slump value in the range of 50mm to 90mm. This concrete is suitable for use where there are normal reinforcements requiring vibration during placing.

In essence, an increase in the concentration of superplasticizer from 1.5% to 2.5% in tuff concrete mix contributed to a reduction of bonding and interlocking between the aggregates and the cement paste resulting in an increase in the workability of the mix. The superplasticizer was very effective in deflocculating and dispersing the cement particles causing more increase in fluidity of tuff concrete than the conventional concrete. The increase in slump of tuff concrete continued with increase in superplasticizer in the mix until segregation and bleeding occurred at an addition of 2.5% superplasticizer. The bleed water and superplasticizer which was not absorbed by aggregates nor consumed during the hydration process was responsible for the negative effects in concrete. The bleed water led to the formation of voids thus lowering the compaction of the wet concrete. A negatively affected concrete mix with lot of mixing water produced a high workability mix which sometimes resulted in a collapse slump.

Table 3: Unit weights of tuff and conventional concretes

Age of concrete in days	Unit weight of tuff concrete in kg/m ³	Unit weight of conventional concrete in kg/m ³
1	2031	2510
14	2036	2515
28	2038	2527

From Table 3 above, the densities of tuff and granite concrete when determined in fresh states were 2031 kg/m³ and 2510 kg/m³ respectively. The water cement ratio of 0.4 was maintained for all the mixtures. When measured at the ages of 14 days, the densities had increased to 2036 kg/m³ and 2515 kg/m³ respectively. When measured after 28 days, the density of tuff concrete increased by 2 kg/m³ to 2038 kg/m³ while granite concrete density increased by 6 kg/m³ to 2528 kg/m³. The densities of conventional concrete ranged from 2510kg/m³ to 2527kg/m³. The 28-day density of normal-weight concrete in particular was found to fall within the range of 2200 kg/m³ to 2600 kg/m³ and was in agreement with the study done by Neville et al. [13]. The 28-day density of tuff concrete was 2038 kg/m³. This was found to be in agreement with the density of lightweight concrete which should not exceed 2200 kg/m³ as per the definition of Euro code 2 [22]. The difference in unit weights of the two concretes was 489kg/m³. This means a structure made with tuff concrete will be lighter in weight by 19.0% than a similar structure constructed with a conventional concrete. Consequently, the earthquake forces affecting the structure will be reduced by 19.0% if tuff concrete was used to construct it instead of the conventional concrete. The lower bulk density of the tuff aggregates in the mix contributed to the low density of tuff concrete whereas higher density of the conventional concrete was due to high bulk density of the granite aggregates in the mix. Proper curing provides a moist environment for the development of hydration products. This reduces the voids in hydrated cement paste increasing the density of microstructure in concrete. The hydration products extend from the surfaces of cement grains reducing the volume of voids. The slight gain in the densities of the two concretes therefore was partially because of absorption of water for hydration process and possibly because of expulsion of air from the voids making the concretes denser as they hardened. The increase in a unit weight of tuff aggregate concrete was 0.34% while that of normal-weight concrete was 0.67% within 28 days. These increments were however insignificant since most structural designs consider unit weights of concretes taken after 28 days. The lightweight concrete reduces the failure of structures in earthquake prone areas by lowering the effect of earthquake forces. Reduced dead load also allows the designers to reduce the sizes of structural members and the amount of reinforcement required in structures as compared with conventional concrete.

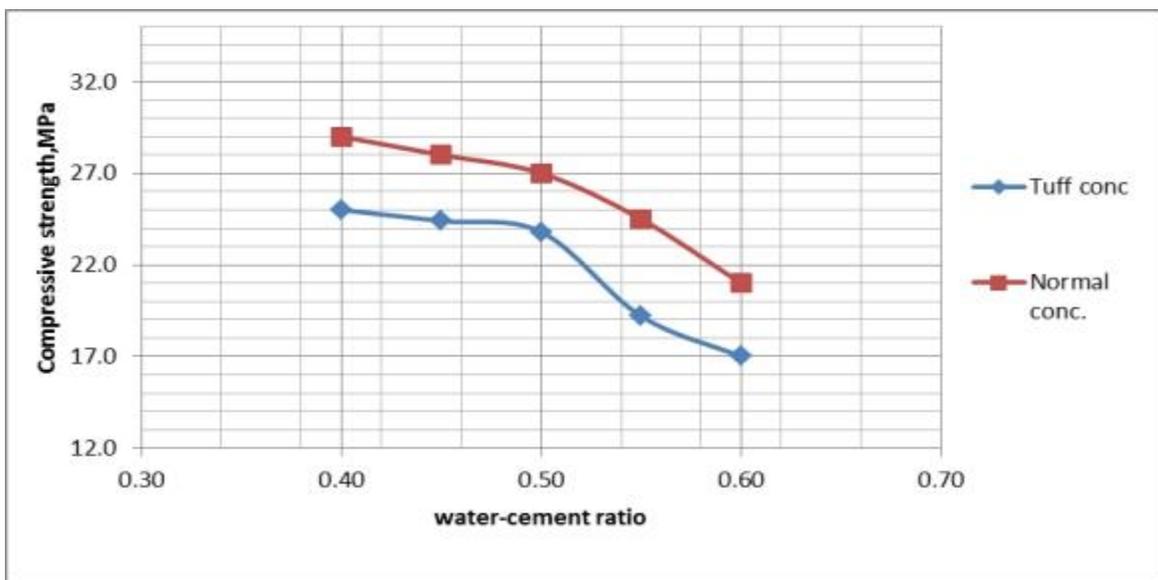


Figure 3.17: Effect of w/c ratio on compressive strength of concretes

From Figure 3.17 above, there was a reduction in the compressive strength of both concretes when the amount of mixing water was increased in the concrete mixes. The amount of cement content was kept constant throughout all the samples. The coarse aggregates of the two concretes were kept in saturated surface dry condition before mixing was done. The compressive strengths were measured on

28-day old concrete cube specimens. It can be observed that the compressive strength of tuff concrete was reduced from 25.0 N/mm² to 24.4 N/mm² when the w/c ratio was varied from 0.4 to 0.45. When the w/c ratio was further increased from 0.45 to 0.50, the compressive strength of the same concrete was reduced from 24.4 N/mm² to 23.8 N/mm². A reduction in compressive strength from 23.8 N/mm² to 19.2 N/mm² was noted when the w/c ratio was varied from 0.50 to 0.55. A further reduction of compressive strength from 19.2 N/mm² to 17.0 N/mm² was recorded when the w/c ratio was increased from 0.55 to 0.60. By increasing the w/c ratio from 0.4 to 0.6, there was an overall reduction of 32% in the compressive strength of tuff concrete. Any amount of excess free water in the concrete that was not absorbed by the aggregates nor used for the hydration of cement was responsible for the decrease in the compressive strength of the concretes. What happens is that the excess water leaves voids which trap the air pockets and hamper the compaction of concrete. It also increases the drying shrinkage as concrete hardens. Drying shrinkage causes the formation of cracks and weakens the concrete causing a reduction in the compressive strength. Similarly, there was an overall reduction in compressive strength of normal-weight concrete from 29.0 N/mm² to 21.0 N/mm² when the water-cement was increased from 0.4 to 0.6 representing 27% drop in strength. Excess mixing water in the concrete mix adversely affected the concrete. This is because the air voids in concrete tended to increase with the increase in the amount of water. Excess mixing water contributed to segregation of concrete. This affected the homogeneity and led to uneven hydration process causing a loss in the compressive strength of concrete. This means the cement paste and fine aggregate required to fill the void spaces between aggregates in the mix separated to form a top layer of fine materials and cement paste while the coarse aggregate material settled at the bottom. As a result, the concrete ended up with voids filled with air and lost the compressive strength. Furthermore, the water that was not consumed by the hydration reaction process evaporated as the concrete hardened leaving microscopic pores that reduced the strength of concrete. A concrete mix with too much water also experienced drying shrinkage as excess water evaporated. This resulted in the formation of internal cracks which again reduced the compressive strength of concrete.

However, the reason why the compressive strength of tuff concrete was generally lower than that of conventional concrete was mainly because tuff aggregates are more porous and less rigid than granite aggregates.

In concrete, the mixing water is available in three different forms, namely the chemically bonded water, the physically bonded water, and the free water. The chemically bonded water is utilized during the hydration process. The physically bonded water is the water bonded to the solid concrete materials by adhesive forces. The free water is the water which is beyond the range of solid surface forces and is considered to behave like in bulk water. The chemically bonded water is not lost in drying. It can only be released out when the hydrates decompose on heating up to 1,000°C. The distribution of the physically bonded water and the free water in porous materials strongly depends on the moisture content.

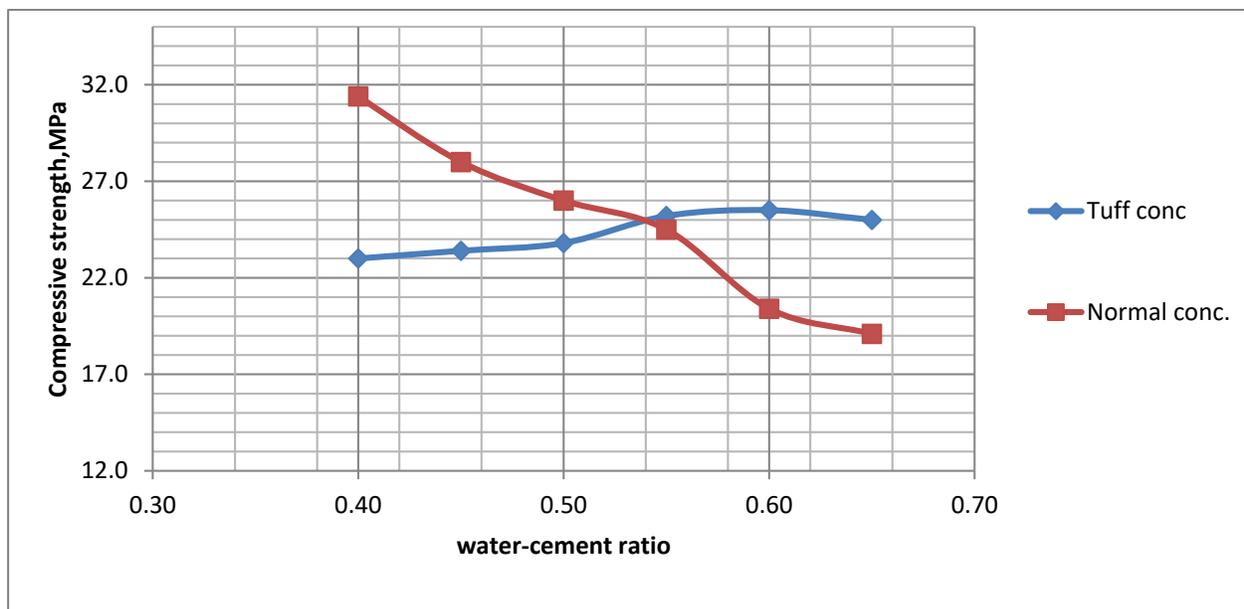


Figure 3.17: Effect of w/c ratio on compressive strength of concrete when dry aggregates are used

From Figure 3.17 above, oven dry aggregates of tuff and granite were used at the time of producing the concrete mixes. When the water-cement ratio was increased from 0.4 to 0.65, there was a reduction in the compressive strength of the conventional concrete as the curve kept falling. The compressive strength of the conventional concrete reduced from 31.4 N/mm² to 19.1 N/mm² representing a drop in strength by 39.0%. This drop is significant as it can alter the whole design and construction of a structure. However, there was an unusual increase in the compressive strength of tuff concrete from 23.0 N/mm² to 25.5 N/mm² when the water cement ratio was increased from 0.40 to 0.60 representing an increase in strength by 10.8%. The compressive strength increased noticeably from 23.8 N/mm² to 25.5

N/mm^2 when the water-cement ratio was increased from 0.50 to 0.60. The compressive strength then started to drop from $25.5N/mm^2$ to $25.0 N/mm^2$ when the w/c ratio was further increased from 0.60 to 0.65. As can be observed from the curves, there was a striking difference in the behavior of the two concretes. What happened is that a lot of free water was accumulated in the mix as the mixing water was increased in the conventional concrete which contributed to the reduction of the compressive strength. The water which remained unabsorbed by aggregates nor used for hydration of cement was responsible for the negative effects in conventional concrete. This is because the conventional aggregates absorbed very little water during mixing as compared with the tuff aggregates. The excess water in the conventional concrete evaporated and left voids which were filled with air. This created weak linkages and bonds between the cement paste and the aggregate lowering the compaction of concrete. As concrete hardened, drying shrinkage cracks developed. This resulted in the reduction of compressive strength of the hardened concrete.

Unlike the conventional aggregate concrete, tuff aggregates absorbed more water into the pores leaving little water for hydration and lubrication of aggregates when water-cement ratio was 0.4. As a result of low water-cement ratio, the cement in the mix did not hydrate fully resulting in a harsh mix which left the aggregates to segregate. The formation of voids occurred in the concrete contributing to a reduction in the compaction of concrete and loss of compressive strength. As the water-cement ratio was increased from 0.40 to 0.60, the aggregates absorbed enough water and left sufficient water for mixing and hydration of cement particles. Adequate water for hydration, improved workability, interlocking of aggregates, and compaction of concrete was available when the w/c ratio was 0.60. Consequently, the air entrapped in the concrete was expelled during compaction leaving a denser concrete. This gave rise to increase in compressive strength to $25.5N/mm^2$. However, with a further increase in the water-cement ratio to 0.65, there was drop in the compressive strength to $25.0N/mm^2$. This means the excess water in the mix contributed to the formation of voids and segregation of concrete. The compaction of concrete was thus reduced leading to a reduction in the compressive strength of tuff concrete to $25.0N/mm^2$. The compressive strengths were taken on 28-day old concrete cube specimens.

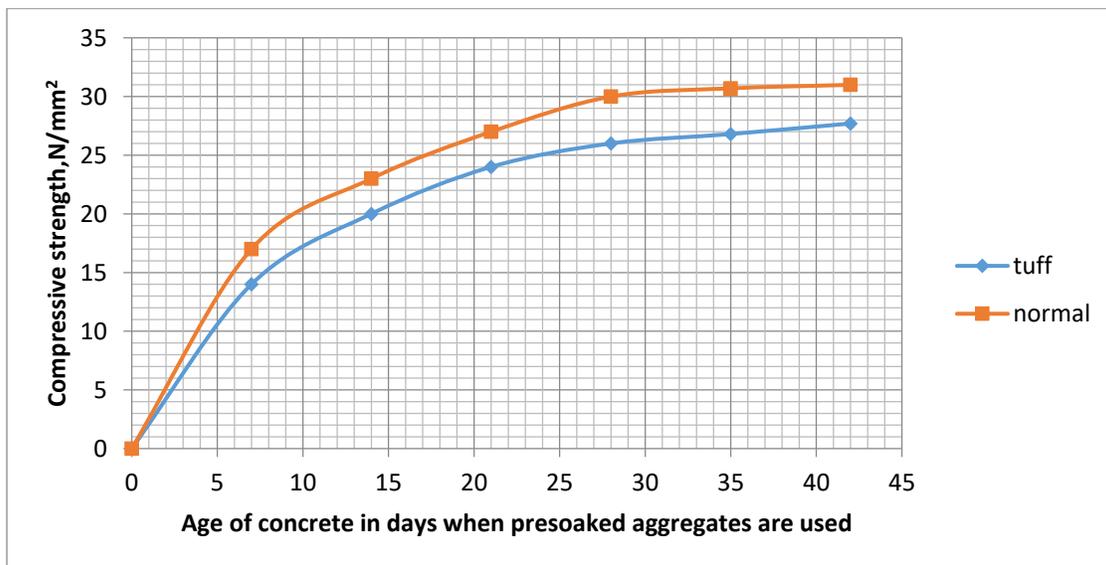


Figure 3.18: Compressive strength of tuff and conventional concrete with age (w/c 0.4)

From Figure 3.18 above, the two concretes registered a sharp increase in compressive strengths within the first 7 days of curing but the rate of increase in strength was noted to slow down as the concretes matured in age. This is because the hydration process is normally faster at early ages of moist cured concrete due to high concentration of tricalcium silicate (Ca_3SiO_5) which is responsible for early strength development in concrete. Tricalcium silicate reacts rapidly with water in a process called hydration to release calcium ions (Ca^{2+}), hydroxide ions (OH^-), and hydro silicate ions ($H_2SiO_4^{2-}$). A large amount of heat is produced during the process as the concrete hardens. This explains why the rate of strength development was higher within the first seven days of the two concretes. Dicalcium silicate (Ca_2SiO_4) reacts more slowly with water and contributes mainly to strength development after 7 days. The process is slower as compared to hydration caused by tricalcium silicate. The hydration of dicalcium silicate leads to formation of amorphous calcium silicate hydrate and calcium hydroxide.

The average compressive strength of tuff aggregate concrete after 7 days was $14.0 N/mm^2$ representing a strength gain of 54 % in comparison with 28-day strength of $26.0N/mm^2$. The normal-weight concrete was $17.0 N/mm^2$ representing a gain of 57% in comparison with 28-day strength which was $30.0N/mm^2$. For structural normal-weight concrete, the strength at 7 days should be between 60% to 65% of the 28-day compressive strength depending on several factors which include the type of cement, type of aggregate, grading of aggregates, curing method, compaction of concrete, quality of raw materials, and water-cement ratio. Most concrete strengths are

designed for 28 days since concretes are expected to gain 100% maturity in strength. The slow gain in strength of two concretes could be because the aggregates used in the mix were uniformly graded and not well graded. Specifically, the conventional aggregates were uniformly graded, elongated and flaky. This could have contributed to a slow rate of growth in the compressive strength within first 7 days. At the age of 14 days, the compressive strength of tuff concrete increased to 20.0 N/mm² representing 77% strength growth in comparison with 28-day strength while that of normal-weight concrete increased to 23.0 N/mm² representing 76.6% strength growth compared with the 28-day strength. In well graded normal-weight concrete mix, the strength growth after 14 days should be around 90% of the 28-day strength. After 21 days the compressive strength of tuff concrete was 24.0 N/mm² while that of normal-weight concrete was 27.0 N/mm². After 28 days, the strength of tuff concrete had increased to 26.0 N/mm² while that of normal-weight concrete had reached 30.0 N/mm². When measured after 35 days, the strength of tuff concrete was 26.8 N/mm² while that of normal-weight concrete was 30.7 N/mm². Although the curing of the concrete samples was stopped after 28 days, it was noted that there was a slight increase in strength of both concretes when tested after 35 and 42 days. However, the increments in the compressive strengths of the tuff concrete were higher than those of the conventional concrete. For example, at 42 days, the strength of tuff concrete sample increased by 1.7N/mm² to 27.7 N/mm² with respect to the 28-day strength while normal-weight concrete strength increased slightly by 1.0 N/mm² to 31.0 N/mm². When compared, tuff concrete registered a higher increment of strength than conventional concrete after 28 days. The increments are attributed to the continuous hydration of dicalcium silicate due to internal curing in the microstructure of the concretes. The higher increment of strength in tuff concrete than in conventional concrete is attributed to the presence of more water in the pores of tuff concrete which facilitated better internal curing than in conventional concrete. However, the strengths of tuff aggregates were in general lower than those of normal-weight concrete. Tuff aggregates have numerous pores in their cellular structure which contributed to lower strengths of tuff concrete. The presence of either interconnected or disconnected pores within the tuff aggregates served as weak spots that allow for the initiation and propagation of cracks when the concrete was compressed. Granite aggregates on the other hand are more rigid and denser than tuff aggregates causing the conventional concrete to have higher compressive strength.



Figure 3.19: Failure mode of tuff aggregate concrete cube sample

In Figure 3.19 above, the concrete cube sample for tuff aggregate concrete displayed a non-explosive failure mode. This was a satisfactory failure mode category. Concrete cracking occurs in three stages. In stage one, as the concrete specimen is loaded, the localized cracks are initiated at the microscopic level at isolated points throughout the specimen where the tensile strain concentrations are the largest. In stage two, the crack system multiplies and propagates but in a slow and stable manner. The final stage involves crack system developing and becoming unstable and the release of strain energy is sufficient to make the cracks self-propagate until a failure

occurs. The reason for such a failure of tuff concrete can be attributed to the presence of interconnected pores within the tuff lightweight aggregates that served as weak spots for the initiation of micro and large cracks within the aggregate. As the applied stress is gradually increased, the micro cracks extended in length and width until they formed major failure cracks passing through the aggregates and thus causing cracking of the specimen along two planes. The concrete cube specimen developed macroscopic cracks which split the specimen into three sections as loading of the cube was increased gradually. However, the crack on the left of the specimen was wider than the crack on the right side of the specimen, owing to high concentration of stresses on the left side of the specimen during loading.



Figure 3.20: Failure mode of normal-weight concrete cube sample

In Figure 3.20, the failure of the conventional concrete specimen resulted in unsatisfactory failure mode with tensile cracks forming near the extreme edges of the left and right hand side faces of the cube. As the load was increased on the specimen, the formation of a microscopic cracks in a concrete developed. These cracks enlarged into macroscopic tensile cracks which propagated into tensile cracks causing failure of the specimen as loading gradually increased in the specimen. The failure was semi-explosive accompanied by a loud sound produced as the specimen failed in compression. The cracks sizes were smaller in width than those in a failed tuff cube specimen. This is because of the high individual elastic moduli of the aggregates and the paste component in the normal-weight cube specimen. The tensile crack on the left face is smaller than the crack on the right side face of the cube. This means the compressive stresses were more concentrated on the right side edge than on the left side edge of the specimen. The crack on the right hand side edge of the concrete cube was thicker in width than on the left hand edge of the specimen most probably due to uneven cement paste distribution during mixing, compaction and placing of the concrete.



Figure 3.21: Tuff concrete specimen tested for splitting tensile strength

The splitting tensile strengths from three cylindrical tuff concrete specimens were 2.7 N/mm^2 , 2.8 N/mm^2 and 3.0 N/mm^2 . The average splitting tensile strength for tuff concrete, therefore, was 2.9 N/mm^2 . The average 28-day cube compressive strength of tuff concrete from the same mix was 25.6 N/mm^2 . The ratio of the tensile stress to compressive strength of tuff concrete was found to be $\frac{1}{9}$.



Figure 3.22: Conventional concrete specimen tested for splitting tensile strength

The splitting tensile strengths from three samples of conventional concrete were 3.5 N/mm², 3.6 N/mm² and 3.7 N/mm². The average splitting tensile strength for the concrete samples was 3.6 N/mm². The average 28-day compressive strength of conventional concrete made from the same concrete mix was 34.8 N/mm². The ratio of the tensile stress to compressive strength of conventional concrete was found to be $\frac{1}{10}$. One common characteristic of conventional concrete is its increased brittleness more than tuff concrete. The ratio of tensile strength to compressive strength is one the methods used to judge the brittleness of the material. The lower the ratio, the more brittle the material. Conventional concrete therefore from this study was observed to be more brittle. The splitting tensile strength values for both concretes were however found to fall within the range of 2.2 - 4.2 MPa specified in most design standards as acceptable for structural design of concretes. However; the tensile strengths for tuff concrete specimens were lower than those of normal-weight concrete. The reason for low tensile strengths in tuff concrete can be attributed to the presence of more interconnected pores within the tuff lightweight aggregates that serve as weak spots for the initiation of cracks within the tuff concrete. This explain why the tuff concrete specimen on failure developed wider plane cracks than conventional concrete. From Figure 3.21 above, two plane cracks were seen after failure of tuff aggregate concrete whereas one plane crack occurred on the conventional concrete specimen as seen in Figure 3.22. Although the load at which NWC failed in tension was higher, its failure mode was sudden and explosive depicting a more brittle behavior than tuff aggregate concrete. It can therefore be deduced that conventional concrete has a poor capacity to resist vibrational loads and may not be suitable for earthquake structures compared to tuff lightweight concrete. Tuff concrete was observed to develop more irregular internal cracks which appeared to spread to the surface while NWC developed fewer plane cracks with the primary crack developing along the plane of loading. The conventional concrete sample failed suddenly producing explosive sound into two parts through the middle of the cross-section. The formation of two major cracks in the case of tuff concrete allows the tensile stresses to be distributed in the cross section of the concrete. This causes the transfer of tensile stresses to the steel in case of a reinforced concrete. This is because at a cracked section, concrete stress is zero but the steel stress is maximum for a reinforced section. However, more cracks in concrete allow the ingress of water into the concrete causing damage to reinforcement by corrosion and eventual failure to the structure.

IV. CONCLUSION

From the current study, tuff aggregates were found to be suitable materials for the production of structural low-density concrete having a 28-day unit density of 2038 kg/m³ and compressive strength of 26.0N/mm² compared with conventional concrete which was found to have a heavier unit weight of 2527 N/mm² and compressive strength of 30.0 N/mm² when aggregates are presoaked prior to mixing and concretes prepared in accordance with procedures outlined in the current study. However, the 28-day compressive strength of tuff concrete improves with increase in water-cement ratio attaining a compressive strength of 25.5N/mm² at w/c ratio of 0.60 when oven dry aggregates are used unlike the conventional concrete where the compressive strength declines as the water-cement ratio increases registering a strength of 20.4N/mm² at w/c ratio of 0.60. The 28-day density of tuff concrete is lower than that of normal-weight concrete by 19.0% making it a suitable material for earthquake structures. The tuff concrete possesses higher strength to weight ratio of 1.3% making it more structurally efficient as compared with conventional concrete which has a ratio of 1.2%. The 28-day tensile strength of tuff aggregate concrete is 2.9 N/mm² while that of normal-weight granite concrete is 3.6 N/mm².

V. RECOMMENDATIONS

Given the 28-day compressive strength of 25.5N/mm² and dry density of 2038kg/m³, tuff aggregate concrete should be used for the construction of high-rise buildings and long-span bridges particularly those situated in earthquake prone areas. Tuff aggregates were noted to absorb more water than conventional aggregates. This property adversely affects the workability of concrete necessitating presoaking of tuff aggregates and the use of super plasticizers during mixing. The effect of internal curing with respect to change in properties of concrete produced from presoaked aggregates should be investigated up to and beyond 90 days for both tuff and conventional concretes. Further research on the durability characteristics of both tuff lightweight concrete and conventional concretes containing different binder contents and water-cement ratios should be done.

ACKNOWLEDGMENT

This research could not have addressed its intended purpose without God's grace and guidance throughout the years of my study. I am very thankful to my first supervisor Prof. Eng. Silvester Abuodha for his invaluable comments and suggestions throughout the stages of this research. Secondly, I would like to express my sincere gratitude to Dr. Eng. John Mwero who was my second supervisor for his guidance, recommendations, and support throughout the length of this research work. Further appreciation goes to the technicians of the civil engineering laboratory of the University of Nairobi for their cooperation during the preparation and testing of materials in the laboratory. I also thank my friends who in one way or the other contributed to the success of this research. Finally, I would like to thank my family members for their never-ending encouragement, love, prayers and motivation throughout my period of study.

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Serum C-Reactive Protein And Serum Uric Acid As Prognostic Markers In Malaria At Western Odisha

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DOI: 10.29322/IJSRP.10.09.2020.p10556
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10556>

Abstract- Background: Malaria causes high mortality and morbidity in various tropical regions which suggest us to identify severity of this disease as early as possible so as to institute timely therapy and avoid the complications. As per world malaria report 2019, an estimated 228 million malaria cases were reported across the world in 2018. The number of malaria deaths in India also decreased by 40 percent in 2018.

Objective: To find relation of Serum CRP & Serum Uric Acid level with prognosis of malaria.

Methods: The study included patients suffering from malaria (*P. vivax* and/or *P. falciparum*) admitted to General Medicine Ward of VIMSAR, Burla. Inclusion criteria of the study is slide microscopy or QBC or ICT and patients aged ≥ 15 years of age of both sexes. Laboratory diagnosis done: Peripheral blood smear examination, Quantitative Buffy Coat (QBC), Non-Microscopic methods: Immunological methods, Serum Uric Acid estimation and Serum C-reactive protein estimation with other routine examination.

Result : In the present study total 55 patients were included, out of which male to female ratio is 1.6:1. Out of which 55% patients were complicated malaria cases and 45% patients were uncomplicated malaria cases. The more number of complicated malaria is contributed by the illiteracy and lack of awareness of the people about the disease and its complications. Uric Acid derived from Plasmodium hypoxanthine would promote crystallization within the local environment and inflammation plasmodium falciparum-derived UA also contributes to the secretion of inflammatory cytokines, such as TNF- α , IL-1 β , IL-6 by peripheral blood mononuclear cells which increases the inflammation. Thus, measurement of CRP and Uric Acid can be useful in understanding the pathogenesis of severe malaria.

Conclusion: CRP and UA can be considered a new, cost-effective, and reliable tool in assessment of prognosis of malaria.

Index Terms- malaria, CRP, uric acid, morbidity, mortality

I. INTRODUCTION

Malaria is a protozoan diseases caused by infection with Plasmodium parasite which is transmitted by the bite of infected female anopheles mosquitoes. It is transmitted in 108 countries containing 3 billion people and causes nearly 1 million deaths each year, plasmodium flaciparum being the most deadly parasite species infecting humans.¹ It remains a major cause of

morbidity and mortality worldwide. Malaria continues to pose major public health problem is state of Odisha. It has only 4% of land area and 3% of population of India. In 2010, Odisha contributed 20% of cases and 17% of deaths due to malaria to the country's burden. Around 85% of the cases reported from the State are due to *P.falciparum* malaria. Female Anopheles mosquito is the vector of malaria. Five species of Plasmodium parasites are there. They are Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, Plasmodium malariae, and Plasmodium knowlesi.¹

The pathogenesis of *P. falciparum* malaria is complex, involving multiple parasite and human factors that, in combination, produce varying levels of immune stimulation and microvascular inflammation. While the degree of inflammation generally correlates with the severity of a malaria episode, the parasite factors that elevate host inflammatory responses from beneficial to pathological levels are not well characterized.

Uric acid (UA) is produced in humans and higher primates as the final product of purine metabolism. Its biosynthesis is catalyzed by xanthine oxidase, which produces reactive oxygen species (ROS) as by-products. Plasmodium elicits host inflammatory responses that causes the symptoms and severe manifestations of malaria. C-Reactive Protein is an acute phase protein that is involved in the activation of complements.² Its secretion is induced by pro-inflammatory cytokines that are secreted by host mononuclear cells in malaria.^{3,4} It binds to the infected RBCs and help in their clearance. This immune activation toward infected RBCs also result in various deleterious effect.^{5,6} Thus, measurement of CRP & Uric acid level can be useful in understanding their role in malaria. In VIMSAR, Burla, in daily duties we encounter a number of cases of malaria and thus, we undertake a prospective observational study among the patients admitted with malaria.

II. MATERIALS & METHODS

The patients having fever with or without features of complications of malaria, like altered sensorium, coma, convulsion, oliguria, icterus, bleeding, acidotic breathing, shock etc. are taken in to consideration and screened for presence of *P.falciparum* and/or *P. vivax* by above mentioned tests. Once malaria is confirmed, then other diseases are excluded by proper history taking, clinical examination, and investigations. And after exclusion of other diseases, the cases are included in the study.

Laboratory Diagnosis of Malaria :

1. Peripheral blood smear examination

Blood films prepared directly from capillary blood. Best time for collection of blood sample is the midway between paroxysms of chills and fever, when the greatest numbers of intracellular organisms are present. It may be necessary to take repeated films.⁷ two types of blood films are used : (a) Thin smears (b) Thick smears.

Thin Smear :

One end of the slide is allowed to touch the top of the blood drop on the patients' finger. The spreader is held at 45 degrees in contact with the drop of blood and the smear is prepared with quick uniform movement such that the margins of the film do not extend to the sides of the slide, and the tail ends near the center of the slide. The film is dried in air.⁷

Thick smear :

Usually 2 to 3 drops of capillary blood from finger prick are directly placed on a clean glass slide, and spreaded with a needle or with the corner of another slide to form an area of about 1 cm². The film is dried in air. The thick film is dehemoglobinised by placing it vertically in distilled water in a glass cylinder for 5-10 minutes, and then dried in air in upright position.⁸

Staining :

Leishman's stain is used for staining of the smear.⁹

2. Quantitative Buffy Coat (QBC):¹⁰

This technique works on the principle of differential centrifugation of blood. Infected red cells appear to be less dense than uninfected ones, and concentrate within a small 1-2mm region near the top of the RBC column, i.e. the buffy layer.

The QBC tube is a specially prepared glass hematocrit tube, pre-coated internally with acridine orange and anti-coagulant potassium oxalate. It has a separating plastic float, which occupies 90% of the interior of the lumen of the tube.¹⁰ The parasites present in the buffy layer are held close to the wall by the plastic float which has the same specific gravity as that of the buffy layer. Upon centrifugation, whole blood separates into plasma, buffy coat and packed red cell layer. The float gets buoyed by the packed blood cells and is automatically positioned within the buffy coat layer.

Blood cells in the buffy coat layer separate according to their densities, forming discrete bands. Platelets remain at the top, lymphocytes and monocytes in the middle, and granulocytes in the bottom, within the buffy coat. Acridine Orange stains the malaria parasite green (nucleus) and orange (cytoplasm).¹¹

The advantages of this method are :

1. Examination time is short, hence can be used to screen large number of blood samples.
2. It is technically easy to perform.
3. The sensitivity is very high. Low levels of parasitemia can be easily detected, as more blood is being used per sample (55µl).¹²
4. It does not require immunological reagents.¹³
5. It can also detect other parasites in blood (Filaria).¹⁴

Serum Uric Acid Estimation : ¹⁵

An automated colorimetric procedure is used for the determination of serum uric acid with improved specificity that is by enzymatic method (uricase peroxidase) with normal value in the range 3-7.9 mg/dl.

Serum C-Reactive Protein Estimation : ¹⁶

Semi-quantitative estimation of CRP was done by agglutination method with commercially available CRP latex test kit with normal value ≤ 6 mg/L. fresh serum obtained by centrifugation of clotted blood is preferred. The sample may be stored at 2-8 degree celcius for 48 hours before performing the test. For longer periods of time the serum must be frozen. Haematic, lipaemic or contaminated serum must be discarded. Other routine investigations: Hb%, TLC, DC, TPC, Blood Urea Nitrogen, S. Creatinine, S. Billirubin, Serum Transaminases, Urine etc done.

Statistical Analysis:

Standard statistical methods were applied, and the analysis performed in Microsoft Excel. Chi square test was applied for qualitative data, and Unpaired student's t-test was applied for numeric data. Level of statistical significance was taken as $p < 0.05$.

III. RESULT & ANALYSIS:

C-reactive protein is thought to have pathogenic role in malaria and it correlates with the complications in malaria. It binds to plasmodium infected erythrocytes and helps in their clearance by both humoral and cellular immune mechanisms. Also, CRP activates complement pathway and platelet activation, and results in various untowards effects.

Similarly, Uric Acid has recently emerged as an important mediator of malaria-induced inflammation. Plasmodium infected erythrocytes accumulate hypoxanthine, a precursor of UA. Imported hypoxanthine is not degraded in to UA within the erythrocyte, since xanthine dehydrogenase activity, which converts hypoxanthine in to UA, has not been detected in this cell type or in the Plasmodium parasite. However, upon erythrocyte rupture and which is normally present in the blood, crystal and whose expression is increased during Plasmodium infection, will efficiently degrade in to UA.

In this study total 55 patients were included, out of which male to female ratio is 1:6:1. Out of which 30 patients were complicated malaria cases and 25 patients were uncomplicated malaria cases. 13 patient died out of 55 malaria patient that accounts for 23% mortality. (Table-1) And out of 13 patients died 11 died of complicated malaria with multiorgan failure.

Table – 1: Demographic and clinical profile of the patients

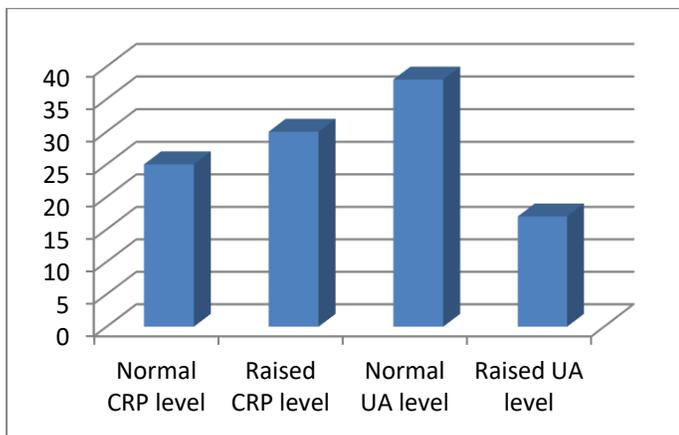
Parameters	Uncomplicated malaria	Complicated malaria	Total
Male	14	20	34 (61.8%)
Female	11	10	21 (38.2%)
No. of patients survived	23	19	42 (76.4%)

No. of patients died	02	11	13 (23.6%)
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Out of 55 patients with uncomplicated and complicated malaria 30 patients (54%) had raised CRP, among which 22 patients (73.%) were complicated malaria and 8 patients (27%) were uncomplicated malaria. So, in this observational prospective study, we found significantly high CRP levels in malaria patients. The CRP level is more in complicated malaria as compared to those in uncomplicated malaria cases. Similarly out of 17 patients who had raised uric acid level, 14 patients (82.4%) were complicated malaria and 03 patients (17.6%) were uncomplicated that is Uric Acid is raised in more number of patients of complicated malaria in which p value is <0.00014 (highly significant).

Out of 13 death patients, 11 patients (85%) had raised CRP level and among them 10 patients (91%) were complicated malaria. So from the above sentence we find significantly high level of CRP in patients who died as a result of malaria, compared to those who survived. This finding is in agreement with previous studies done at West Bengal, India.⁵ Similarly, Fig. 1 shows the serum uric acid level is found to be significantly high in complicated malaria compared to uncomplicated malaria. This is in agreement with study done by Tatiana M. Lopera-Mea et al on Malian children.¹⁷ In our study, we found that uric acid level is also high in patients who died of malaria, compared to those who survived.

Fig. 1: CRP and Uric Acid level in relation to malaria



From table 2, we found mean level of UA in complicated malaria to be 7.61 mg/dl and uncomplicated malaria to be 5.21 mg/dl. A similar study conducted by Tatiana M. Lopera-Mesa also found similar result but in their study they found comparatively lower mean value as compared to our study, that is, in complicated malaria they found mean serum UA level as 5.69 mg/dl and in Uncomplicated malaria as 4.60mg/dl.¹⁷

Table-2: UA mean value in complicated and uncomplicated malaria

Parameters	Uncomplicated malaria mean (mg/dl)	Complicated malaria mean (mg/dl)
	5.21	7.61

Parameters	Uncomplicated malaria mean (mg/dl)	Complicated malaria mean (mg/dl)
Males	6.65	7.43
Female	4.73	7.97
Total	5.21	7.61

From table 3, we found mean level of CRP in complicated malaria to be 23.71 mg/dL and uncomplicated malaria to be 10.77mg/L. That means it is more raised in complicated malaria as compared to that in uncomplicated malaria (p<0.0423).

Table 3 : CRP mean value in complicated and uncomplicated malaria

Parameters	Uncomplicated malaria mean (mg/dl)	Complicated malaria mean (mg/dl)
Males	5.42	25.84
Female	17.59	19.46
Total	10.77	23.71

Similar studies done by Bhavita Patel et al.⁶ and Vandana Agrawal et al.³ also found similar result but they found higher level of Serum CRP as compared to our study in both complicated and uncomplicated malaria.

IV. SUMMARY & CONCLUSION

To summarize, the serum level of CRP and UA are increased in malaria patients. And their value was more in complicated malaria as compared to uncomplicated malaria which indicates that it correlates with the severity of the disease. Hence, early estimation of serum CRP and UA can be done to know the prognosis of malaria.

Case fatality rate in this study was 23.6%. Incidence was higher in males than in females. The male to female ratio was 1.6:1. Out of 55 patients 30(55%) patients have raised serum CRP level from which 22 (73%) were complicated malaria and 8 (27%) were uncomplicated malaria. Serum UA level were increased in 17 (31%) patients out of 55 patients, from which 14 (82%) were complicated malaria and 3 (18%) were uncomplicated malaria. Out of 13 death patients 11 patients (84.6%) had raised CRP level and among them 10 patients (91%) were complicated malaria. Out of 13 death patients 8 patients (61.5%) had raised UA level and among them 7 patients (87.5%) were complicated malaria. The mean value of UA in complicated malaria is 7.61 mg/dl and uncomplicated malaria is 5.21 mg/dl. The mean value of CRP in complicated malaria is 23.71 mg/L and uncomplicated malaria is 10.77 mg/L.

Malaria is a protozoan disease whose incidence is high worldwide including India causing high mortality. We analyzed how serum CRP and serum UA levels correlates with the severity of the disease. The higher levels of serum CRP and UA in complicated and uncomplicated malaria suggest their definite relation with the disease. But whether this high levels of serum CRP and UA is contributed by the disease or they are giving rise to the severity of the disease need to be ascertained. That is, the role of serum CRP and UA in the pathogenesis of malaria is to be determined which require further studies.

A larger study, involving more inflammatory biomarkers and including serial measurement of these parameters would better clarify their role, either singly, or in combination, in malaria.

ACKNOWLEDGEMENTS

Authors would like to thank our patients for their adherence and kind cooperation.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee Registration Number ECR/861/Inst/OR/2016

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Non-point source pollution and its impact on drinking water quality in River Nile- A case study of Juba South Sudan

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DOI: 10.29322/IJSRP.10.09.2020.p10557
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10557>

Abstract- Continuous deterioration of River Nile water quality in the Juba has become a major area of concern. Population growth, urbanization, and rural-town immigration have to lead to a population increase in the Juba. This study attempted to investigate the impact of urbanization and industrialization on water quality. Secondary data and mathematical models were used to compute the concentration of pollution in drinking water quality. The results reveal that anthropogenic pollutants were highly contributing to the pollution of the basin by 78%, non-anthropogenic factors contributed 22%. The pollutant concentration found was 9.13 g/m³. Nutrients was as low as 0.000055g/L and phosphorous was 0.000009g/L. The average fecal coliform range from 15.25–102.6 CFU/100ml that shows highly contaminated. The pH and temperature were normal. TDS showed very high, ranging from 47–123 mg/100ml that is far beyond the EPA, and WHO recommended 500 ml/L. The EC was not so high, fluctuating between 59µs-201µs/cm, which is slightly above the recommended 160 µs/cm. The study concluded that the raw water from River Nile is not suitable for drinking without treatment. Therefore, the study recommended appropriate water quality management and the installation of a drinking water plant.

Index Terms- River Nile. Non-Points Source Pollution, Total load concentration, Nutrients concentration, Drinking-Water Quality.

I. INTRODUCTION

Water pollution has become a global issue that calls the attention of academicians, Politicians, and society [1, 2]. Water pollution is the leading worldwide cause of deaths and diseases and accounts for the deaths of more than 14,000 people daily[3]. The water crisis in both quantity and quality has risen as a global issue and has drawn more attention from government, industry, and academe. Generally, a series of physical, chemical, and biological parameters are designed as water quality criteria for evaluating the safety of water, not only for drinking water but also for reclamation [4].

The human right to water and sanitation was recognized by the United Nations General Assembly in 2010 and reflected in the new United Nations Sustainable Development Goals (UN-SDGs) of September 2015. Goal 6 ensures universal access to safe and affordable drinking water for all by 2030[5]. The United Nations World Water Development Report 2015 puts water at the core of sustainable development goals. It is an essential element of services, which supports poverty reduction, economic growth, and environmental sustainability[6].

Water pollution refers to the contamination of water bodies such as aquifers and groundwater. It occurs when pollutants are discharged directly or indirectly into water bodies without adequate treatment to remove harmful compounds[7-9]. Natural phenomena such as volcanoes, algae blooms, storms, and earthquakes cause savior changes in water quality and the ecological status of water. The anthropogenic factors which contributing to water pollution such as demographic processes, economic growth, social change, technological innovation, policies, and laws also exert pressure on water quality. Unfortunately, the alteration of water masses endangers human health, which is greatly affected by unsafe water and prevents adequate sanitation and hygiene, which in turn increases the risk of contracting and transmitting water-related diseases[10].

Recently many water resources are contaminating with anthropogenic sources and agricultural activities[11]. The poor fecal disposal and poor hygienic practices favor the spread of pathogenic microorganisms, including viruses, bacteria, and parasites. These microorganisms are responsible for various illnesses and may lead to death[12, 13]. Therefore, the same water that is essential to life may be the source of the disease that may lead to suffering, chronic disability, and death[14-16].

River Nile is one of the world's longest rivers; its basin is shared by 12 countries[17]. It rises and flows from Lake Victoria to sudd wetland and connects with the Blue Nile in Khartoum and other Rivers and flow to the Mediterranean Sea after covering 3,349,000 square kilometers. River Nile entered Juba with a width of 402 meters[18].

Juba is flowing with water throughout the year. Pollution of water bodies in the area has become a critical issue, which is more difficult because of the inadequacy or non-existence of surface water quality protection or management policies. Lagoons, rivers, and streams are becoming dumping sites for wastes without little treatment[19]. The discharge of raw sewage, garbage, as well as oil spills are threats to the diluting capabilities of the lagoons and rivers. Heavily polluted water may traverse long distances before a significant degree of purification is achieved. Therefore, rivers and streams become increasingly polluted from domestic and industrial wastewater dumped by residential and small factories. Water pollution threatens both environmental and human health concern[20].

Drinking water quality has increasingly become a critical issue in Juba. Streams, lagoons, and River Nile that are the main source of drinking water become more contaminated, due to lack of technology and knowledge people in Juba rely on natural purification and considered previous river and lagoons water quality and consume with basic or without basic drinking water treatment. However, the specific objectives of this study are; To assess the amounts of anthropogenic and animal pollutants within the Juba area that contribute to water pollution, the concentration of the loads in the river, and raw water quality.

II. MATERIALS AND METHODS

2.1-Study area.

Juba is the capital city of the new country Republic of South Sudan, after its independence in 2011. The city is located in the southern part of South Sudan in Central Equatoria State along both sides of the White Nile River Bank. Its geographical coordinates are 4° .51' .0" North and 31° .37' .0" East. With an elevation of 457 meters above sea level, is situated in vast expanses of open space, including swamplands and agrarian landscapes. It is estimated to occupy approximately 23,300 hectares. Greater Juba, including the surrounding rural lands, encompasses roughly 23 kilometers in diameter with a population density of 1,577,902 with a growth rate of 1.92[21]. Juba has a spectacular landscape rugged topography, high grounds, and plains, the general ground has an average altitude, 468 meters above sea level with a gentle slope to the north[22].

The River Nile system is the dominant physical feature, and all streams in the area drain into the Nile. The Nile enters the city with a width of about 400 meters and an average discharge of 34,000 million cubic meters per year, it may increase in early or late May due to the heavy rainfall in the upper streams and will drop water late December with the decrease in rainfall. [23]. The Nile basin receives an average of 650 millimeters of rain annually [24, 25], with a flow velocity of 0.85 m/s to 1.15 m/s[26]. The area consists of a light loamy and heavy loamy soil that is not heavy cracking, medium water holding capacity with medium over[23].

The area under study was from latitude 4.799425 N⁰ to the longitude of 31.604538E⁰ upstream, to the latitude 4.948336 N⁰ and longitude of 31.65393E⁰ downstream respectively.

Table (1) showing population growth in Juba from 1972 to 2019

[1] Year	[2] 1973	[3] 1993	[4] 2005	[5] 2010	[6] 2019
[7] Population	[8] 56,737	[9] 114,980	[10] 250,000	[11] 548,953	[12] 1,577,902

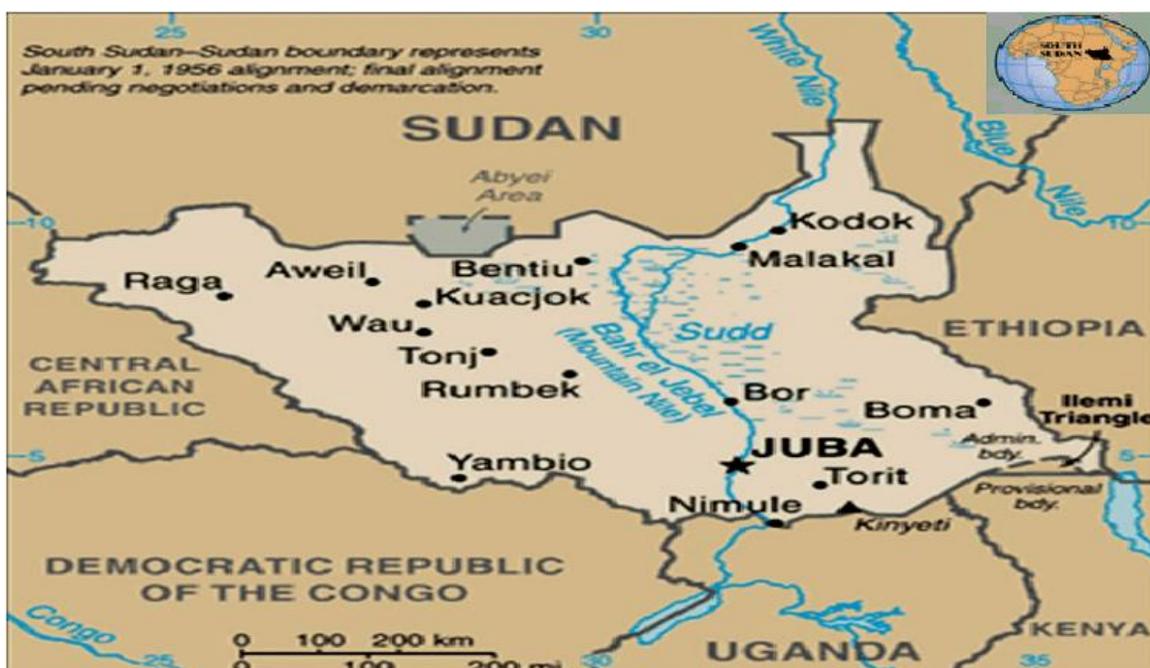


Figure (1) shows the map pointing to the location of Juba in South Sudan and the River Nile.
 Source: (<https://www.cia.gov/library/publications/the-world-factbook/geos/od.html>, 2013)

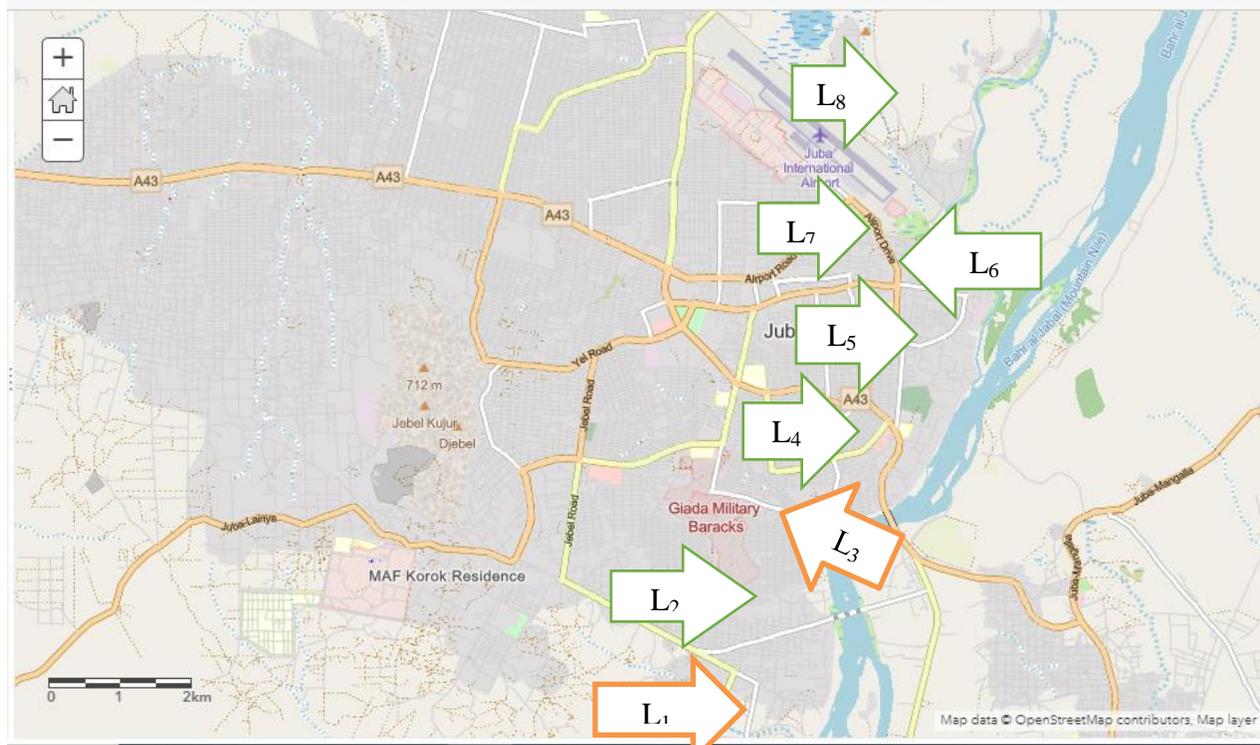


Figure (2). Showing drinking water intake, and the water sampling points in the River Nile

ArcGIS Online is used to develop a map for the location of the River Nile, residential areas, agricultural areas. And water sampling points.

2.1.1-Climatic condition of the study area

The climate of Juba is tropical, with an average yearly maximum temperature of 34 °C and the average annual minimum temperature of 21 °C, the Maximum temperature is experienced from January to March and the minimum temperature from April to July. The rainy season starts from April to October. The average annual rainfall was 953.7 mm[19]. It has a dry season with a small amount of rain, start from November and intensifies from December to March. The type of vegetation is more biologically diverse and is not generally very dense. Examples of common trees are Teak, shrubs, mango trees, etc. The rate of weathering is very high due to the combination of both high temperature and rainfall, the environment condition hydrolysis, oxidation, and reduction, and the physical condition of the area[22].

The table (2-1) showing temperature, humidity and wind velocity

[1] Month	[2] Min Temp	[3] Max Temp	[4] Humidity	[5] Wind	[6] Sun	[7] Rad	[8] ETo
	[10] °C	[11] °C	[12] %	[13] Km/day	[14] Hours	[15] MJ/m ² /day	[16] Mm/day
[17] January	[18] 19.0	[19] 36.7	[20] 43	[21] 78	[22] 6.9	[23] 18.5	[24] 4.45
[25] February	[26] 21.5	[27] 37.5	[28] 45	[29] 78	[30] 6.4	[31] 18.7	[32] 4.65
[33] March	[34] 22.6	[35] 37.2	[36] 51	[37] 112	[38] 5.9	[39] 18.6	[40] 5.10
[41] April	[42] 23.2	[43] 35.2	[44] 63	[45] 112	[46] 5.7	[47] 18.1	[48] 4.70
[49] May	[50] 22.4	[51] 33.5	[52] 74	[53] 112	[54] 7.4	[55] 20.1	[56] 4.64
[57] June	[58] 21.6	[59] 32.2	[60] 79	[61] 78	[62] 7.1	[63] 19.1	[64] 4.12
[65] July	[66] 20.9	[67] 31.0	[68] 81	[69] 78	[70] 5.8	[71] 17.3	[72] 3.69
[73] August	[74] 20.8	[75] 31.3	[76] 79	[77] 78	[78] 6.7	[79] 19.3	[80] 4.06
[81] September	[82] 21.0	[83] 32.6	[84] 75	[85] 78	[86] 7.6	[87] 21.0	[88] 4.49
[89] October	[90] 21.2	[91] 33.8	[92] 71	[93] 78	[94] 7.0	[95] 19.7	[96] 4.37
[97] November	[98] 20.8	[99] 34.5	[100]63	[101]78	[102]7.0	[103]19.0	[104]4.31
[105]December	[106]19.7	[107]35.7	[108]55	[109]78	[110]7.1	[111]18.5	[112]4.31
[113]Average	[114]21.3	[115]34.3	[116]65	[117]86	[118]6.7	[119]19.0	[120]4.41

CLIMAT WATER and CROP WATER Soft wares were used for metrological data by using Juba international airport automatic rain gage 300 meters from the study area.

Table (2-2) showing monthly precipitation and annual precipitation in the area.

[1] Months	[2] Rain/ mm	[3] Effective Rainfall/mm
[4] January	[5] 3.6	[6] 3.6
[7] February	[8] 11,6	[9] 11.4
[10] March	[11] 44.9	[12] 41.7
[13] April	[14] 91.9	[15] 78.4
[16] May	[17] 148.5	[18] 113.2
[19] June	[20] 119.7	[21] 96.8
[22] July	[23] 136.2	[24] 106.5
[25] August	[26] 144.4	[27] 111.0
[28] September	[29] 116.6	[30] 94.8
[31] October	[32] 101.7	[33] 85.2
[34] November	[35] 46.3	[36] 42.9
[37] December	[38] 7.0	[39] 6.9
[40] Total Rainfall	[41] 972.4	[42] 792.4

2.1.2-Economic growth

Economic in Juba depending on the economics of the country, it depends on 98% on the oil revenues. But the country's economy is considered low. Real GDP growth was an estimated 5.8% in 2019, a large increase from 0.5% in 2018. Inflation fell to 24.5% in 2019 from 83.5% in 2018 due to reduced financing of the fiscal deficit. The central bank commitment to reduce monetization of the fiscal deficit is expected to continue, with resulting inflation declining further to 16.9% in 2020 and 9.7% in 2021.

The 2019 state budget was estimated at \$1.3 billion, a 155% increase from 2018. Nonoil revenue increased by an estimated 19% in 2019. The fiscal deficit was estimated at 2.5% of GDP in 2019, down from 6.1% in 2018. Reforms will help move the fiscal deficit, projected at 1.3% of GDP in 2020, to a surplus of 0.5% in 2021. Private investment in the non-oil sector reached an estimated \$22 million in 2019[27]. GDP per capita is 275\$, GINI co-efficiency is 45.5 medium, and the human development index is 0.413 low to 0.264(Inequality-adjusted Human Development Index) IHDI[28]. As the poverty line is \$2 a day[29]. 36% of the population in Juba is below 2%[30]. That means the poverty rate in Juba is 36%.

2.1.3-Agriculture activities

The rain-fed Agriculture system is dominant in the area. 99% percent of agricultural activities in the area are substantial farmers of small scale. The application of organic fertilizer in vegetable farms is common with zero chemical fertilizer application [23]. Animal production is one of the cultures in the area for social and economic purposes. However, people are growing Goat, Sheep, Pigs, and Poultry on a small and large scale. With the growth of livestock farming, animal dung has increasingly become one of the sources of water pollution in the capital city through the excretion they produce that include feces and urine [31]. Table (7) shows domestic animal waste excretion in the area.

Table (3) shows different categories of animals and its excretion in Kilogram

[1] Item	[2] cows	[3] sheep	[4] Goat	[5] Pigs	[6] Poultry
[7] Number	[8] 8,434	[9] 28,283	[10] 32,783	[11] 758	[12] 85,568

2.1.4-Urbanization

The urbanization in Juba is estimating at around 52km2. Since 2005, is expanding westwards through Munuki Payam towards Gudele, Guri, and Northern Bari and southwards towards Rajaf Payam and along Yei road[32]. Rural-urban immigration, internal displacement due to the conflict, and the flow of people from foreign countries have seen to be the indicator of high population growth in Juba. Although fluctuating significantly at times, Juba's population has increased steadily over the years.

Table (4) shows population density in Juba from 1965 to 2019

Year	1956	1973	1993	2005	2010	2019
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Population density	10,600	56,737	114,980	250,000	500,000	1,577,902
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2.1.5- Organic Waste Generation and its Composition

The amount of municipal Organic waste generation in Juba differs from place to place to a great extent; its production pattern has been affected by consumption patterns, the standard of living, climate, economic, season, and cultural practice. The municipal organic waste generated per-capita (kg/day), is relatively low when compared to some South Asian countries. Its per-capita ranges between 0.33 to 0.44 kg/person/day, unlike that of the South Asian countries that vary in a range from 0.3 to 0.9 kg/person/day. Table (5) shows the household municipal waste (kg) generated in Juba city[33].

2.1.6-Source of water pollution in the River Nile area

Contamination of water (River Nile) bodies was recognized to become a critical issue due to the inadequacy or non-existence of surface water quality protection and sanitation[34]. Lagoons, rivers, and streams are sinks for wastes[35].

Generally, 80% of the municipal wastes generated in Juba are not collected. As a result, the uncollected garbage, which is often also mixed with human and animal waste founding their way into the water body without treatment[20, 36]. The discharge of raw sewage, garbage, and oil spills has become a threat to human health as well as the aquatic ecosystem. Although the government of Juba believes in natural purification, however, heavily contaminated water may travel for long-distance for days before a significant degree of decontamination obtains [38].

2.1.7-Sources of data

Secondary data were collected from the literature on human population density, the number of animals, River Nile water discharge, etc, CROPWAT and CLIMWAT databased were used to collect climatic data, actGIS online was used to produce a map of Juba.

2.2-Methods

2.2.1-Surface Runoff Volume

Empirical Equations were applied to calculate Runoff Volume[39]. Precipitation is needed to calculate the amount of water that forms run-off due to saturation of the soil. Was calculated by using formula bellow;

$$R=P \cdot P_j \cdot R_v \cdot A \tag{1}$$

Where: R is the Run-off, P is annual rainfall in the study area as abstracted from Juba international airport metrological station which is 972 mm, P_j is the fraction of a rainfall event that causing run-off, is consistent usually 0.9, R_v is run-off co-efficient and for residential areas are 0.5, and A is the total catchment area, was measured by ArcGIS online and found to be 214.2 km².

2.2.2-Estimation of total load components

The excretion coefficient method was applied to compute the amount of waste generated by animals and human beings in residential areas and around[40]. Data on the population density, number of animals, and their categories were obtained from the literature[19, 40, 42]. Sewage generated per capita and animal dungs excreted per capita by domestic animals were collected[8]. "X" is the manure excrement (kg/animal/day) "i" the category of an animal. 365.25 is the days per year. Tables (5,6 and 7) Showing the calculation of waste generated by animals and human beings and contributing to River Nile drinking water pollution by using the model bellow.

$$Load = \sum_{i=1}^{365.25} X_{i1}, X_{i2}, X_{i3}, X_{i4}, \dots \tag{2}$$

Whereby "I" represent the category of organic waste products, X representing the category of animals produced the waste.

2.2.3. Estimation of nutrients generated by waste.

Nutrient Balance Model was used to compute the composition of nutrients (N and P) generated from domestic, sewage, and animal waste [40]. The following are the formulas.

$$N_{\text{residential areas}} = NUM_{\text{pop}} \cdot X_{\text{EXC human}} \cdot N \tag{3}$$

$$P_{\text{residential areas}} = NUM_{\text{pop}} \cdot X_{\text{EXC human}} \cdot P \tag{4}$$

$$N_{\text{livestock}} = \sum_{i=1}^n NUM_i \cdot X_{\text{EXC}_i} \cdot N \tag{5}$$

$$L_{\text{livestock}} = \sum_{i=1}^n NUM_i \cdot X_{\text{EXC}_i} \cdot P \tag{6}$$

Here, "N" refers to residential areas, "P" residential areas, N_{livestock}, and P_{livestock} are the amounts of Total Nitrogen and Total Phosphorus from feces of city residential areas and livestock manures, respectively. In Equations. (4) and (5), NUM_{pop} is the population of the study area, obtained from the Statistical Yearbook; EXC_{human}, N and EXC_{human}, P are the annual excretion coefficients per capita[19].

In Equations. (5) and (6), "n" is referred to the number of livestock categories, and NUM_i is the number of animals in the 'i' livestock category, both obtained from the statistic book of the study area[41]. EXC_{i, N}, and EXC_{i, P} are the excretion coefficients of Total Phosphorus and Total Nitrogen for the 'i' livestock category, with values obtained from the literature[40]. All the information is required to compute the Total Nitrogen and Total Phosphorous from waste generated from residential areas and domestic animals as listed in Tables (5,6 and 7).

2.2.4-Load of pollutant and Nutrients amount entered the waterbody

SWAT (Soil & Water Assessment Tool) formula was used to calculate Export Coefficient for load and nutrients (N &P) delivered annually to a water body as the result of water overflow[43]. Below is the formula for export efficiency calculation.

$$L = \sum_{i=1}^n Ei(pi ai) \tag{7}$$

Whereby L: output load of a pollutant (kg/year) for human or domestic animals; Ei; export coefficient in residential areas is equal to 0.5; Pi: number of people or domestic animals (head); ai: unit load (kg/year/head) the amount of organic waste produced by person varied from one area to another based on the cultural, economic and educational level table (5,6 and 7) shows the organic waste generated per capita in different residential areas in Juba [33]. The data on the average amount of feces produced per person per day obstructed from the literature[42]. The total number of animals in the area collected from an article[44]. Waste generated per animal per day abstracted from a book[20, 42].

2.2.5-Load Concentration calculation.

Load concentration is the concentration of pollutants in the water body as the result of discharging of pollutants by tributaries from points and non-points source into the waterbody and diluted with the water volume. It was calculated by summing up the total load entered into the watershed divided by river water discharge, the formula below illustrating the method.

$$C = \frac{L}{Q} \tag{8}$$

Whereby C is the concentration, L is the load of the pollutants, and Q is the annual river discharge.

2.2.6- Raw water analysis result

Systematic literature review method was used under MATA ANALYSIS protocol to compile the findings of the studies done on River Nile water quality analysis in Juba, Web of Science, Google Scholar, and Science Direct search engines was tried by entering key words "River Nile Water Quality in Juba". With control years of publication from 2010 to 2010. So far, one article was found, which was published in 2013[19].

III. RESULT AND DISCUSSION

3.1-Total run-off in the area

The Run-off was determined using rainfall data obstructed from Juba airport automatic metrological station through CLIMWAT & CROPWAT software. The station is 50 meters from the study area. The result obtained using formula (1).

P = Annual rainfall (inches)=972.4 Pj= Fraction of annual rainfall events that produce run-off (usually 0.9)

Rv = Runoff coefficient for residential areas=0.5

A= the total catchment area

R=972*0.9*0.5* 214,200,000m

R = 93,729,636,000 m³/year

3.2-Result for a total load of waste and nutrients generated in Juba

The tables (5,6 and 7) show the amount of waste and sewage generated by residents of Juba, Dung excreted from the animals in and around Juba, and amounts of Nutrients P and N that would be produced by the load.

Table (5): Shows household municipal organic waste and nutrients generated in Juba per year

[1] Residential areas	[2] Population	[3] MW(Kg)/Capi/ta/	[4] MW(Kg)/area/day	[5] MW(Kg)/ area /year	[6] N (Kg/t)	[7] P (Kg/t)	[8] N (Kg)/t/population	[9] P (Kg)/t/population
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		day			of MW			
[10] Kator	[11] 184,300	[12] 0.67	[13] 123481	[14] 45070565	[15] 1.58	[16] 0.16	[17] 71211.49	[18] 7211.29
[19] Juba	[20] 124,776	[21] 0.56	[22] 69874.56	[23] 25504214	[24] 1.58	[25] 0.16	[26] 40296.66	[27] 4080.67
[28] Munuki	[29] 413,000	[30] 0.58	[31] 239540	[32] 87432100	[33] 1.58	[34] 0.16	[35] 138142.72	[36] 13989.14
[37] Referendum	[38] 281,480	[39] 0.51	[40] 143554.8	[41] 52397502	[42] 1.58	[43] 0.16	[44] 82788.05	[45] 8383.60
[46] Gud ele)(1 & 2)	[47] 502,867	[48] 0.62	[49] 311777.54	[50] 113798802	[51] 1.58	[52] 0.16	[53] 179802.11	[54] 18207.81
[55] Rajaf	[56] 12,415	[57] 0.65	[58] 8069.75	[59] 2945458.8	[60] 1.58	[61] 0.16	[62] 4653.82	[63] 471.27
[64] Gumbo	[65] 45,460	[66] 0.56	[67] 25457.6	[68] 9292024	[69] 1.58	[70] 0.16	[71] 14681.40	[72] 1486.72
[73] Lologo	[74] 13,604	[75] 0.59	[76] 8026.36	[77] 2929621.4	[78] 1.58	[79] 0.16	[80] 4628.80	[81] 468.74
[82] Total	[83] 1,577,902	[84] 4.74	[85] 929781.61	[86] 339,370,287.7 [87]	[88] 1.58	[89] 0.16	[90] 536205.05	[91] 54299.25

Table (6) showing the amount of sewage produce in Juba city discharge to open space and contributing to water pollution.

Residential areas	Population	Average sewage(Kg)/person/day	Sewage(Kg)/area/year	Average TN(Kg)/a	Average TP(Kg)/a
Kator	184,300	0.25	16817375	290940.59	29430.41
Juba	124,776	0.25	11385810	196974.51	19925.17
Munuki	413,000	0.25	37686250	651972.13	65950.94
Referendum	281,480	0.25	25685050	444351.37	44948.84

Gudele (1 & 2)	502,867	0.25	45886613.75	793838.42	80301.57
Rajaf	12,415	0.25	1132868.75	19598.63	1982.52
Gumbo	45,460	0.25	4148225	71764.29	7259.39
Lologo	13,604	0.25	1241365	21475.61	2172.39
Total	1,577,902		143,983,557.5	2490915.54	251971.23

Table (7) showing manure extracted by different categories of animals and nutrients produced.

[1] Animal	[2] Amount	[3] Manures(kg/animal/Day)	[4] Manure (Kg)/animal/year	[5] Manure (Kg)/animal population/year	[6] TN (Kg)/Tone	[7] TP (kg)/Tone	[8] TN (kg)/Animal category/year	[9] TP (kg)/Animal category/year
[10] cattle	[11] 8,434	[12] 29.5	[13] 10,620	[14] 89,569,080	[15] 4.37	[16] 1.2	[17] 391416.88	[18] 107482.90
[19] sheep	[20] 28,283	[21] 2.3	[22] 828	[23] 23,418,324	[24] 6.32	[25] 4.5	[26] 148003.81	[27] 105382.46
[28] goats	[29] 32,783	[30] 1.8	[31] 640	[32] 20,981,120	[33] 6.92	[34] 4.9	[35] 145189.35	[36] 102807.49
[37] Pigs	[38] 758	[39] 5.1	[40] 1,836	[41] 1,391,688	[42] 5.88	[43] 3.4	[44] 8183.13	[45] 4731.74
[46] Poultry	[47] 85,568	[48] 0.08	[49] 30	[50] 2,567,040	[51] 9.84	[52] 5.4	[53] 25259.67	[54] 13862.02
[55] Total	[56] 155,826	[57] 39.008	[58]	[59] 137,927,252	[60]	[61]	[62] 718052.84	[63] 334266.60

3.3-Total organic waste generated in the area

Total organic waste generated in the area was calculated by summing the other organic waste and sewage generated by the individual in Juba and multiply by the number of people living in Juba, plus amount dung excrement by each category of the animal as shown in model (2)

$$\text{Total organic waste generated} = 339,370,287.7 + 143,983,557.5 + 137,927,252 = \underline{621,281,097.2 \text{ kg}}$$

$$\text{Load} = 621,281,097,200\text{g} * 0.5 = \underline{310,640,548,600 \text{ g}}$$

3.4-Load Concentration calculation in the basin

Load concentration is the concentration of the load in the water body, was calculated by using formula (8) above.

$$C = \frac{\text{Concentration (mg/L)} = \text{Load/discharge}}{\text{Discharge} = 34,000,000,000 \text{ m}^3}$$

$$\begin{aligned} \text{Load} &= 310,640,548,600 \text{ g} \\ &= 310,640,548,600 \text{ g} / 34,000,000,000 \text{ m}^3 \\ C &= 9.13 \text{g/m}^3 \end{aligned}$$

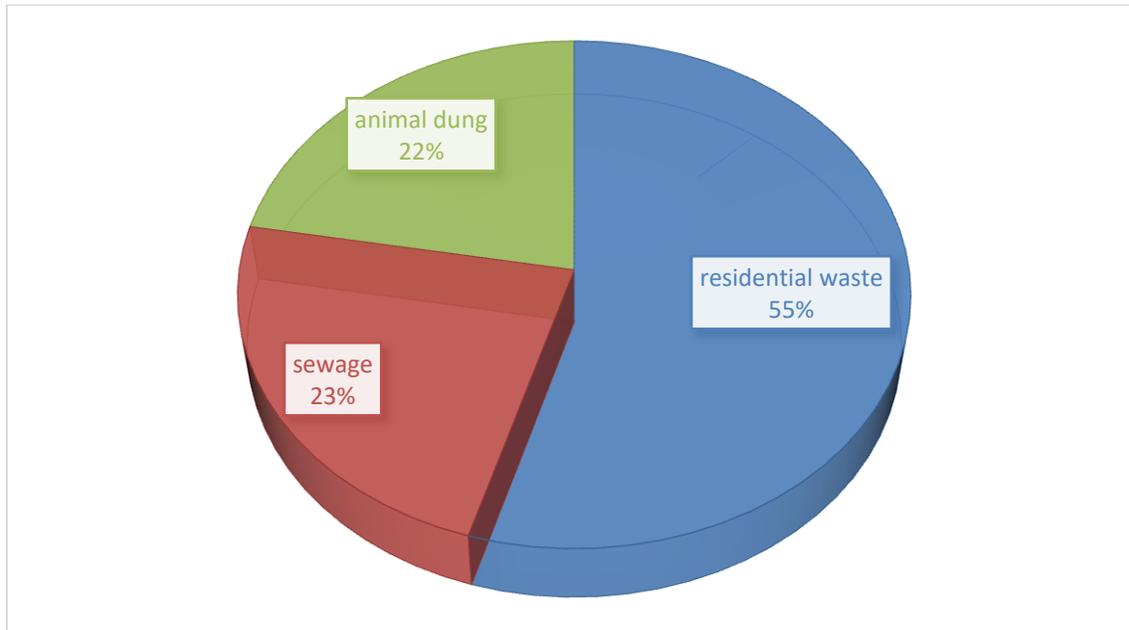


Figure (3) Showing percentage of pollutant load shared by Livestock and human being

The chart clarified the pollutant rate contributing by the human being and domestic animals around the catchment areas discharging water to the River Nile area of Juba. The result shows that human beings are highly contributed to water pollution in Juba with a percentage of 78% which involved residential waste and sewage produced by people in Juba as goes together with the result of the study by[19]. These pollutants may found their way to the water body through surface flow due to inappropriate waste and waterbody management in the country. The river water is, therefore, get contaminated with pathogens that come as a result of the discharge of sewage, animal waste, and other domestic waste. The study indicated that each person would release 100-400 billion coliforms per day in addition to other harmful bacteria[45]. These coliforms are dangerous to the health of human beings because of the consequences seen in the high cases of water-related diseases in the area such as typhoid, diarrhea, hepatitis A and gastrointestinal infections that appear to be chronic[46].

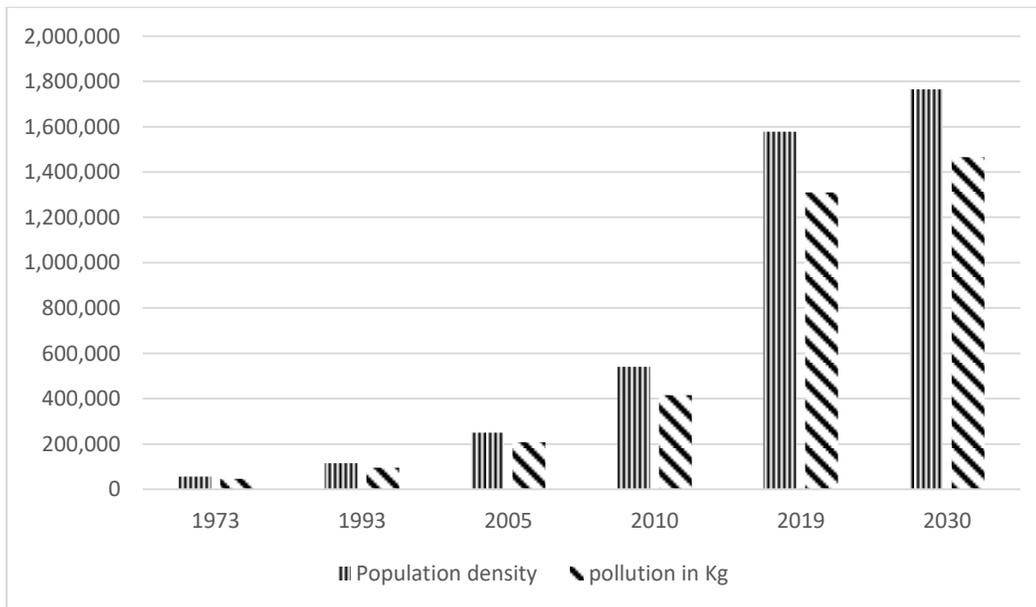


Figure (4) residential and sewage generated in Juba and expectation for 2030

Then graph showing that an increase in population density is positively correlated with an increase in waste production if we assume other waste generated parameters are consistent such as economic, education level, culture, and environmental protection policies with the same population growth rate which is 1.92%.

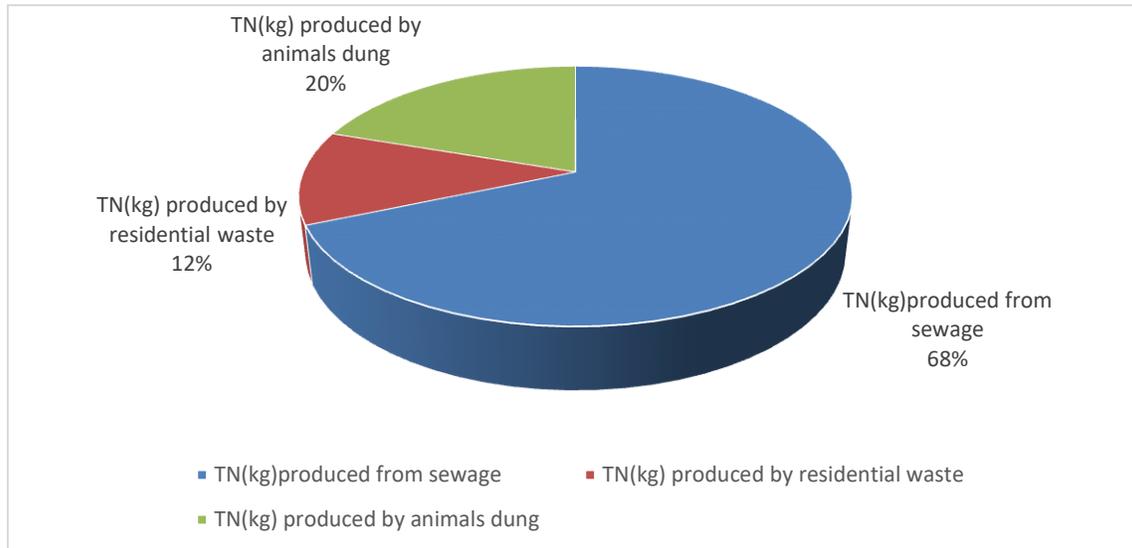


Figure (5) showing the percentage of Total Nitrogen produced by different waste

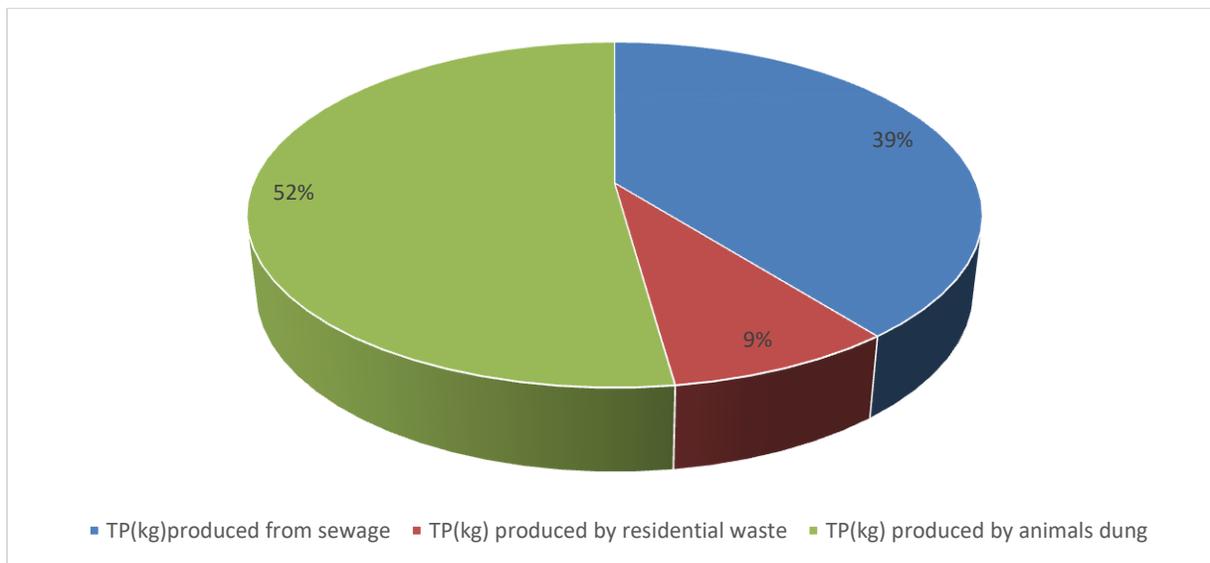


Figure (6) shows the percentage of Total Phosphorus produced

The effects of human activities and animals nearby reservoir watershed can be realized by the accumulation of nutrients in the water body, resulting in cultural eutrophication of the reservoir with subsequent bloom in algae and changes to the water quality[47]. Based on the analysis, the result proving that sewage is the mean source of N and second for P production.

3.5-Nutrient concentration in the River Nile

The concentration of Nutrients is measured by summing total Nitrogen after subtraction of the run-off coefficient divided by river discharge. The reason for nutrient concentration calculation is to measure whether the nutrient amount generated from residents and animals within Juba is enough to cause eutrophication in the River Nile area of Juba.

$$\begin{aligned} \text{Total Nitrogen load} &= 3745173.43 * 0.5 = 1,872,586,715 \text{ g} \\ \text{Nitrogen concentration in the river} &= \text{Load divided by discharge} \\ 1,872,586,715\text{g}/34,000,000,000,000 \text{ L} &= 0.00005507608\text{g/L} \end{aligned}$$

$$\text{Total Phosphorous load} = 640537.08 * 0.5 = 320,268,540 \text{ g}$$

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10557>

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Phosphorous concentration in the River = $320,268,540/34,000,000,000,000$ L
= 0.000009419663 g/L

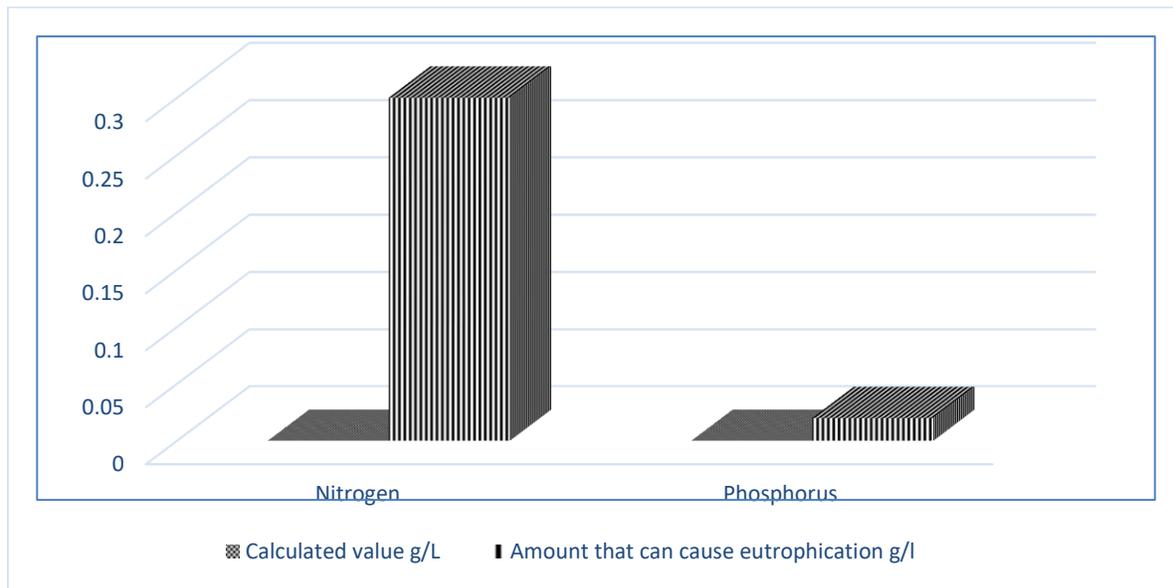


Figure (7) showing the concentration of N and P in the River Nile area of Juba.

Based on the models (2 to 8), the concentration of Nitrogen and phosphorus produced from the residential areas and animals in and around Juba is $P=0.000009419663$ g/L and $N=0.0000557608$ g/L. Refer to (Yang 2008), shows that the concentration of the nutrients is not enough to cause eutrophication. As was recommended that the eutrophication or red tide occurs when Nitrogen concentration in water reaches 0.3g/L[47], and Phosphorus concentration reaches 0.02g/L[48]. Therefore, eutrophication is not the problem of drinking water quality in the River Nile area of Juba.

3.6- Water quality analysis

Eight mean drinking water collection sides were selected, from upstream of Juba Rajaf to its downstream Molobor Village.

Table (8) Shows the result of the River Nile water analysis.

[1] Site's Number	[2] Site's Name	[3] CFU/100ml Average Reading	[4] Physical Parameters			
			[5] PH	[6] Temperature	[7] TDS	[8] EC
[9] L ₁	[10] Rajaf west(upstream)	[11] 33.04	[12] 8.3	[13] 28°C	[14] 92	[15] 185 μ _s
[16] L ₂	[17] Lologo	[18] 38.19	[19] 8.3	[20] 28°C	[21] 94	[22] 187 μ _s
[23] L ₃	[24] Juba Bridge	[25] 43.95	[26] 8.2	[27] 28.3 °C	[28] 98	[29] 189 μ _s
[30] L ₄	[31] Juba water port	[32] 77.85	[33] 7.2	[34] 28.1°C	[35] 79	[36] 190 μ _s
[37] L ₅	[38] Urban water cooperation (intake point)	[39] 97.05	[40] 8.2	[41] 28 °C	[42] 98	[43] 201 μ _s
[44] L ₆	[45] Jebel Nyoka	[46] 102.6	[47] 8.4	[48] 28.3°C	[49] 123	[50] 229 μ _s
[51] L ₇	[52] Gabat	[53] 98.6	[54] 7.4	[55] 28.1°C	[56] 98	[57] 205 μ _s
[58] L ₈	[59] Molobor village	[60] 15.25	[61] 6.8	[62] 28°C	[63] 47	[64] 89 μ _s

The results showed that the average fecal CFU/100ml concentration for all the eight sampled sites of the River Nile range between 15.25 – 102.6 at location L₁ to L₈ accordingly. The fecal coliform count range is far above the 0mpn/100ml for drinking water as the standard recommended by WHO [49, 50]. The fluctuation of PH was within the range[47]. The increase of fecal coliform varies from one station to another; it shows directly in relationship with the population density of the areas. The contamination of this water

body was not only due to human beings but a high population of animals within the catchment areas. It is following the finding of other writers[45].

This poor quality of water comes as contamination of the river with human wastes, animal manure, improperly treated septic, and sewage discharge into the river without treatment. During precipitation, bacteria and harmful microorganisms may be drained into the water body [46].

Refer to the WHO recommended standard for drinking water, raw water from the River Nile area of Juba is not suitable for drinking without treatment. 72.5% of the people in Juba depending on River Nile raw water for drinking[20], which means 72.5 % of the people in Juba under risk of waterborne disease.

IV. CONCLUSION

Generally, drinking water pollution becomes a critical issue, especially in a developing country, which is not only affecting human health but also the aquatic ecosystem. Due to heavy rains and flooding, waste generated by human beings and animals in and around the city would be swept into the water body, and contributing to water quality deterioration[51]. The result of the study shows that water of the River Nile in the areas of Juba is contaminated. It would be a key pillar of waterborne diseases such as diarrhea, cholera, hepatitis A. On the other hand, the result reveal that the nutrient concentration generated by waste is too little to cause eutrophication in the water body. Figure (4) shows that waste generation in Juba positively correlating with population density. The water analysis result shows that the raw water from River Nile areas of Juba is not healthy for drinking due to the high fecal coliform count range that was found high than the recommended standard of WHO that is design to be 0mpn/100ml[48]. The study concluded that without integrated waste and drinking water body management, it will be difficult for the government of South Sudan in Juba to meet Sustainable Development Goal SDG 6 by 2030 [52]. Therefore, the study recommended that there should be intergraded water resources management, waste disposal system, wastewater and sewage should be treated before discharge into water bodies. Awareness programs and pollution control law enforcement body is needed, drinking water treatment plant is recommended to reduce the risk caused by poor water quality.

ACKNOWLEDGMENT.

The author acknowledges the support offered by Tongji University (Shanghai) in particular the Instituted of Environmental Sciences and Sustainable Development (IESD) and my supervisor, Prof Fang Ping being supportive during proceeding with this article.

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Quality Assurance Indices as Correlates of Students' Academic Achievement in Public Secondary School in Imo State

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DOI: 10.29322/IJSRP.10.09.2020.p10558

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10558>

Abstract

In this study, the researcher investigated the relationship between quality assurance predictors and students' academic achievement in public secondary schools in Imo State, Nigeria. The research design adopted for the study is the descriptive survey research design. Four research questions and five hypotheses guided the study. The population of the study consisted of 208,465 students from 320 public secondary schools in the study area. The simple proportionate random sampling was adopted to choose 4,126 students as the sample size from 6 public secondary schools in the state with 2 secondary schools chosen from each of the 3 educational zones of Imo state. The instrument used to collect data was Quantity Assurance Indices as Correlates of Academic Achievement of Students in Public Secondary Schools Questionnaire (QAICAASPSSQ). The instrument was validated by 3 experts; two from the Department of Educational Management and Policy and one from the Department of Educational Foundations. The instrument comprises two sections. Section A is concerned with the influence of quality assurance indices on students' academic achievement while section B dealt with the impediments that hinder quality assurance indices from enhancing students' academic achievement. The validity of the instrument was established through a pilot-testing analysis using Cronbach alpha which yielded 0.86 and 0.87 respectively and an average of 86.5 which was considered high enough to be reliable. For the purpose of the analysis, each of the items in the instrument was scored. The four points rating scale was used in scoring the responses of the respondents. Each item was weighted and calculated as: Strongly Agree (SA) = 4points, Agree (A) = 3points, Disagree (D) = 2points and Strongly Disagree (SD) = 1 point. Data were collected by the researcher with the help of five research assistants. Pearson Product Moment Correlation and regression analysis were used to carry out the analysis. Pearson Product Moment Correlation was used to answer the research questions and to test the null hypotheses 1,2,3 and 4 while regression analysis was used to test hypothesis 5. In testing the hypotheses, when p-value was lesser than 0.05 ($P < 0.05$), it was rejected while a hypothesis with p-value greater than 0.05 was accepted. Data were analysed using Statistical Packaging for Social Sciences (SPSS). It is therefore recommended that personnel and other quality assurance indicator should be provided in schools for effective teaching and learning.

Key Words: Quality Assurance, Indices, Correlates, Students, Academic Achievement

Introduction

All human agencies especially those engaged in human capital development like secondary schools are in need quality assurances because quality assurance is the process of ensuring that the learners are maximally imparted with the skill and knowledge as was stated in national educational goals (Okeke-James, et al, 2020). Therefore, an investigation into the indices of

quality assurance is a necessary and worthy task. They are the instruments that pattern job performance and quality service delivery in every organization (Kerka, 2003). Quality assurance indices are the indicators that are used to establish or enhance the performance of an acceptable standard of work (UNESCO, 2012).

The word quality indicates a high degree of goodness. It is a high standard of excellent service or work. It is a level of satisfaction that is associated with work done or service rendered (Gibson, 2007). Quality, according to NBTE (2014) is efficiencies of service that conform to the standards and good result demanded by clients. In business circles, quality can be taken to mean a sublime standard of service, job or product that has met the prescribed degree of excellence. In educational system, quality is the satisfaction of stakeholders such as parents, students, teachers and the general public that the teaching, training and learning offered including research work carried out by staff and students are of expected standard.

Quality assurance as a concept defines all planned and systematic actions or process necessary for providing sufficient confidence to managers and clients that the products or services being offered will satisfy the required or specific requirements for quality use. It is a process of ensuring that controlled mechanisms are working to maintain and enhance standard (Edumark, 2016).

In the school system, quality assurance is the totality of the system's resources and information devoted to setting up, maintaining and improving the quality and standard of teaching, mentoring and monitoring, research and services to the public. Mensah (2009) stated that quality assurance also involves the evaluation of a system or a school and its operations against certain prescribed standards for self-assurance that control devices are working to make output or result correspond to set objectives. Within the context of teaching and learning, quality assurance means that the process of ensuring that practices and procedures or actions intended to enhance quality and excellence in the key areas of classroom lesson delivery and test administration are complied with.

At the level of educational administration and planning designed to guarantee improved students' academic achievement, quality assurance indices imply all the efforts being made by government, non-educational agencies, education planners and school authorities to provide quality education. It is the provision of tools that can be used to establish confidence that activities which centre on knowledge articulation and transformation of students are carried out with optimum standards in school. It therefore speaks of the provisions and effectiveness of methods that ensure quality teaching and mentorship in school (Edumark, 2016).

These provisions are funding, personnel, facilities, motivation, and supervision. The issue of funding is concerned with the money that is used to run the school. Education as a social and essential service cannot run without money. It is money that is used to pay staff and procure facilities for both staff and students to use in school (Coornson, 2008). As a matter of fact, Whitehead (2006) asserted that whatever that is available in a school in terms of science equipment, libraries, buildings and other accessories to learning is a direct function of the amount of money made available to the school. Money is given to school in the form of grants through the state or national budgetary allocation to education. It is however unfortunate that budgetary allocation to education in Nigeria is low and Imo State is not an exception and this is in spite of the directions of UNESCO in that regard.

UNESCO (2008) stipulated that 26 percentage of annual budget of developing countries should be allocated to education and the reason for this is not far-fetched. Education is fundamental to the development of a think-tank of any nation. So, any nation that places high premium on human capital development and must have a sustainable welfare and infrastructural development should pay special attention to education and invest money on it.

The idea of personnel refers to the people that make up the staff of an organization or school. Their recruitment, selection, placement, appraisal and development are fundamentally the duty of the ministry and the school authority (Edumark, 2016). Personnel involve people and the whole duty of planning, organizing and controlling can be seen as objective tasks that are assigned and carried out by people in the school. Thus, every event in the school setting revolves around people (Dickson, 2009).

Therefore, the provision of adequate personnel in a school is corollary to quality job performance. Adequacy here means recruiting and posting trained and qualified teachers in their right numbers to schools. Cornel (2007) stated that teachers are the ones that implement the curriculum as they teach the students in their normal work. They are part of policy planners and they are the ones that implement school rules and regulations. They ensure that deviants within the students' community are disciplined in order to enforce obedience or compliance to school rules and regulations.

The provision of facilities in a school is a major effort at making the school system to work (Hagfiz, 2006). Facilities constitute a unique aspect of quality assurance indices. They are service equipment in the laboratory, equipped school libraries, spacious classrooms for students, offices for the principal and every other staff, resource materials for teachers, fans, air conditioners and even computers and cabinets that help to make work easy. In fact, Longe (2007) stated that facilities make up the infrastructures in the school. Longe further stated that these facilities need to be adequately provided in the school if teaching and learning must go on effectively.

Motivation is what makes people behave or act the way they do. It is a matter of perception which makes a worker express his needs and the satisfaction that elicits commitment from him (Simon, 2007). Motivation is defined by Edumark (2008) as the provision of money and material fillips that satisfy the emotional and psychological needs of a worker. The extent to which workers behave, depends on the degree to which their needs have been provided for. Simon (2007) pointed out that in motivation, the overriding consideration is that workers especially teachers in the school system contribute their goals to the growth of the organization in return for the inducement the organization or the school offers them.

According to Walter (2006), workers sustain their membership of an organization when their activities result in the realization of the organizational set goals and contribute directly or indirectly to the achievement of their individual goals. The process of motivation is initiated by the conscious or unconscious recognition and effort to satisfy the needs of workers. Supervision involves the presence of a superior officer in the work place, looking out for the performance of the junior workers. It is the process of inspecting what is done to know if performance is in line with what is expected to be done (Elymer, 2008).

Combi (2006), states that it is the assessment of work technology or instrument used to do the work and the results of work done to ascertain whether it conforms to job design and expected outcome. In the school system, there is a strong system of constant supervision of workers and operatives (Lutan, 2006). The advantages of this cannot be over-emphasised. It reduces waste of materials and makes the younger teaching and non-teaching staff to be more committed to their jobs knowing that their departmental heads and other senior colleagues are monitoring them.

Academic achievement refers to the performance, result or outcome of learning and test conducted in a term or school year. Academic achievement can be said to be the knowledge attained or degree of competence in school assignments and activities. The poor or low level of academic achievement in school makes the provision of quality assurance indicators very necessary. It has been argued that the students' ability to study independently, the school climate and parents' ability to monitor the academic work of their children account for the performance of the students more than the provision of quality assurance indicators.

Kroma (2009) however, stated that the availability of quality assurance indicators in their right quantity and quality facilitates the independent study and research of students. The idea of quality assurance is not a novel. The history could be traced to the world war II when ammunition was inspected and tested. Most of the guns used in the war were discovered to be defective after the war. This according to Edumark (2016) accounted for why they were not maximally used. Today, quality assurance systems emphasize dictating or identify errors or defects before going into final production. In the school system, it is checking leakages and closing defective outlets in teaching and learning in order to attract and sustain the confidence of stakeholders in the educational system. It is a mechanism of ensuring an improved students' academic achievement at the end of the school year.

Statement of the Problem

The purpose of this study is to investigate the impact of quality assurance indices on the academic achievement of students in public secondary schools in Imo state. Quality assurance indices are the totality of resources, human and material that are devoted to the setting up, maintaining and improving the quality and standards of teaching, research and other services tendered to students in the school.

It involves problem identification, system evaluation and operational editing in a school in order to ensure that teaching and learning are of acceptable quality and standards. It is believed that if quality assurance indicators are adequately provided in the school, and teachers adopt the right pedagogy, there will be an enhanced students' academic achievement.

However, in Imo state, the academic achievement of students has persistently been low (WAEC Chief Examiners' Report, 2017). In addition to this, there seem to be the dearth of empirical studies on the effects of quality assurance indices on the academic achievement of students in public secondary schools. This accounts for why this study is directed to investigate quality assurance indices as correlates of students' academic achievement in public secondary schools in Imo State, Nigeria.

Purpose of the Study

The purpose of the study was to ascertain the relationship between quality assurance indices and academic performance of students in public secondary schools in Imo state. Specifically, the study investigated;

1. The relationship between availability of personnel and academic achievement of students in public secondary schools in Imo state.
2. The relationship between availability of facilities and academic achievement of students in public secondary schools in Imo state.
3. The relationship between teacher motivation and academic achievement of students in public secondary schools in Imo state.
4. The relationship between instructional supervision and academic achievement of students in public secondary schools in Imo state.

Research Question

The study is guided by the following research questions.

1. What is the relationship between availability of personnel and academic achievement of students in public secondary schools in Imo state?
2. What is the relationship between availability of facilities and academic achievement of students in public secondary schools in Imo state?
3. What is the relationship between teacher motivation and academic achievement of students in public secondary schools in Imo state?
4. What is the relationship between instructional supervision and academic achievement of students in public secondary schools in Imo state?

Hypotheses

The following hypotheses have been adopted to aid the study

1. There is no significant relationship between availability of personnel and academic achievement of students in public secondary schools in Imo state.
2. There is no significant relationship availability of facilities and academic achievement of students in public secondary schools in Imo state.
3. There is no significant relationship between teacher motivation and academic achievement of students in public secondary schools in Imo state.

4. There is no instructional supervision and academic achievement of students in public secondary schools in Imo state.
5. There is no significant combined relationship between availability of personnel, availability of facilities, teacher motivation and instructional supervision and academic achievement of students in public secondary schools in Imo state.

Method

The study investigated quality assurance indices as correlates of academic achievement of students in public secondary schools in Imo state. The study adopted correlation research design. Four research questions and five null hypotheses guided the study. The population of the study consisted of 208, 465 students from 320 public secondary schools in the study area. The simple proportionate random sampling was adopted or used to choose 4,126 students from 6 public secondary schools in the state with 2 secondary schools chosen from each of the 3 educational zones of Imo state.

The instrument used for data collection was Quality Assurance Indices as Correlates of Academic Achievement of Students in Public Secondary Schools Questionnaire (QAICAASPSSQ). The instrument for the study was validated by three experts, two from the Department of Educational Management and Policy and one from the Department of Educational Foundations. The instrument consists of two sections. Section A is concerned with the influence of quality assurance indices on students’ academic achievement while section B has to do with the impediments that hinder quality assurance indices from enhancing students’ academic achievement.

The validity of the instrument was established through a pilot-testing and analysis using Cronbach alpha which yielded 0.86 and 0.87 respectively and an average of 86.5 which was considered high enough to be reliable. For the purpose of the analysis, each of the items in the instrument was scored. The four-rating scale was used in scoring the responses of the respondents. Each item was weighted and calculated as; Strongly Agreed (SA) = 4points, Agreed (A) = 3 points, Disagree (D) = 2points and Strongly Disagree (SD) = 1point.

Data were collected by the researcher with the help of five research assistants. Pearson product moment correlation and regression analysis were used to carry out the analysis. Pearson product moment correlation was used to answer research questions and to test null hypotheses 1, 2, 3 and 4 while regression analysis was used in testing hypothesis 5. In testing the hypotheses, any hypothesis with p-value lesser than 0.05 ($p < 0.05$) was rejected while a hypothesis with p-value greater than 0.05 was accepted. Data were analysed using Statistical Package for Social Science (SPSS).

Results

Research Question 1

What is the relationship between availability of personnel and academic achievement of students in public secondary schools in Imo state?

Table 1: Pearson correlation co-efficient of availability of personnel and students’ academic achievement

Variables	N	\bar{X}	SD	r	Relationship
Availability of Personnel		3.94	0.68		
	4,113			0.82	Strong positive relationship
Students’ Academic Achievement		3.65	0.96		

Table I indicates a correlation index of 0.83 showing a strong positive relationship between the availability of personnel and students’ academic achievement. This means that availability of teaching and non-teaching personnel in schools enhances academic achievement of students.

Research Question 2

What is the relationship between availability of facilities and academic achievement of students in public secondary schools in Imo state?

Table 2: Pearson correlation co-efficient of availability of facilities and students’ academic achievement

Variables	N	\bar{X}	SD	r	Relationship
Availability of Facilities		3.79	0.71		
	4, 113			0.85	Strong positive relationship
Students’ Academic Achievement		3.53	0.83		

Table 2 shows a Pearson’s coefficient (r) of 0.85 which indicates a strong positive relationship between availability of facilities and students’ academic achievement. This means that the provision of facilities in schools enhances students’ learning and academic achievement.

Research Question 3

What is the relationship between teacher motivation and academic achievement of students in public secondary schools in Imo state?

Table 3: Pearson correlation co-efficient of teachers motivation and students' academic achievement

Variables	N	\bar{X}	SD	r	Relationship
Teachers Motivation		3.19	0.59		
	4,113			0.91	Strong positive relationship
Students' Academic Achievement		2.82	0.85		

Table 3 shows a Pearson's coefficient (r) of 0.91 which indicates a strong positive relationship between teachers motivation and students' academic achievement. This means that the motivation of teachers enhances students' academic achievement in secondary schools.

Research Questions 4

What is the relationship between instructional supervision and academic achievement of students in public secondary schools in Imo state?

Table 4: Pearson correlation co-efficient between instructional supervision and students' academic achievement

Variables	N	\bar{X}	SD	r	Relationship
Instructional Supervision		3.67	0.77		
	4,113			0.81	Strong positive relationship
Students' Academic Achievement		3.52	1.09		

Table 4 shows a Pearson's coefficient (r) of 0.81 which indicates a strong positive relationship between instructional supervision and students' academic achievement. This means that effectiveness of instructional supervision in secondary schools enhances students' academic achievement.

Testing of Hypotheses

Hypothesis 1

There is no significant relationship between availability of personnel and academic achievement of students in public secondary schools in Imo state.

Table 5: Pearson product moment correlation analysis of relationship availability of personnel and students' academic achievement

N	cal. r	df	P-value	Remarks
4,113	0.81	4,111	0.01	Significant

Table 5 shows that at 0.05 level of significance and 4,111 degree of freedom, the p-value is 0.01. Since the p-value of 0.01 is less than the alpha level ($p\text{-value} = 0.01 < 0.05$), the null hypothesis is rejected. This means that there is a significant relationship between availability of personnel and academic achievement of students in public secondary schools in Imo state.

Hypothesis 2

There is no significant relationship availability of facilities and academic achievement of students in public secondary schools in Imo state.

Table 6: Pearson product moment correlation analysis of relationship availability of facilities and students' academic achievement

N	cal. r	df	P-value	Remarks
4,113	0.85	4,111	0.04	Significant

Table 6 shows that at 0.05 level of significance and 4,111 degree of freedom, the p-value is 0.04. Since the p-value of 0.04 is less than the alpha level ($p\text{-value} = 0.04 < 0.05$), the null hypothesis is rejected. This means that there is a significant relationship between availability of facilities and academic achievement of students in public secondary schools in Imo state.

Hypothesis 3

There is no significant relationship between teacher motivation and academic achievement of students in public secondary schools in Imo state.

Table 7: Pearson product moment correlation analysis of relationship between teachers motivation and students' academic achievement

N	cal. r	df	P-value	Remarks
4,113	0.91	4,111	0.00	Significant

Table 7 indicate that at 0.05 level of significance and 4,111 degree of freedom, the p-value is 0.04. Since the p-value of 0.00 is less than the alpha level ($p\text{-value} = 0.00 < 0.05$), the null hypothesis is rejected. This means that there is a significant relationship between teacher motivation and academic achievement of students in public secondary schools in Imo state.

Hypothesis 4

There is no instructional supervision and academic achievement of students in public secondary schools in Imo state.

Table 8: Pearson product moment correlation analysis of relationship instructional supervision and students' academic achievement

N	cal. r	df	P-value	Remarks
4,113	0.81	4,111	0.02	Significant

Table 8 shows that at 0.05 level of significance and 4,111 degree of freedom, the p-value is 0.02. Since the p-value of 0.02 is less than the alpha level ($p\text{-value} = 0.02 < 0.05$), the null hypothesis is rejected. This means that there is a significant relationship between instructional supervision and academic achievement of students in public secondary schools in Imo state.

Hypothesis 5

There is no significant combined relationship between availability of personnel, availability of facilities, teacher motivation and instructional supervision and academic achievement of students in public secondary schools in Imo state.

Table 9: Regression analysis on the combined relationship of the predictor variables on students' academic achievement

N	R	R Square	Adjusted R Square	%	Cal. F	df	P-value	Remarks
4,113	0.097	0.009	0.008	0.8	8.50	4,111	0.00	Significant

Table 9 shows that with R Square Adjusted of 0.008 which means that the relationship between availability of personnel, availability of facilities, teacher motivation and instructional supervision jointly contribute 0.8 percent of students' academic achievement. Also, at 0.05 level of significance, 2 df numerator and 4,111 df denominator the calculated F8.50 with P-value 0.00, the null hypothesis is rejected. This means that there is a significant combined relationship between the predictor variables and academic achievement of students in public secondary schools in Imo state.

Discussion

The findings of the study as contained in Table 1 showed that there is a strong positive relationship between availability of personnel and students' academic achievement. This suggests that the availability of teaching and non-teaching personnel in their right quality and number enhances the academic achievement of students. However, the case of the schools in the study area is

different. There is shortage of personnel especially the teaching staff and this accounts for the poor performance of students in examination (WAEC Examiners Report, 2017).

In table 2, the finding indicated that there is a strong positive relationship between availability of facilities and students' academic achievement. This presupposes that the more facilities are available, the higher the academic achievement of students. This is in agreement with the submissions of Longe (2007). Facilities in public secondary schools in Imo State are always inadequate and this is due to the ever-increasing students' enrolment in schools.

In table 3, it could be seen that there is a strong positive relationship between motivation and students' academic achievement. Motivation here represents all forms of incentives given to teachers to encourage them do their work well. It ranges from in-service training arranged in the form of workshop or seminar to prompt payment of teachers' salaries and promotion of teachers as and when due (Eaton, 2005).

However, in Imo state, teachers' promotion to the next rank is irregular while their salaries are always delayed. This according to Edumark (2016) affects teachers' productivity and discourages their initiativeness.

In table 4, the finding showed that there is a strong positive relationship between instructional supervision and students' academic achievement. This means that academic achievement of students is enhanced if their academic works are monitored and they are mentored on what to do from time to time.

Cumulatively, the findings of the study revealed that there is a high or strong positive relationship between the correlate or predictor variables with students' academic achievement.

Conclusion

The findings of this study indicated that there is a strong positive relationship between quality assurance indicators and students' academic achievement (Mensah, 2009). It would however be agreed as Kroma (2009) puts it that if these quality assurance predictors are not provided in their correct quantity and quality, students' academic achievement will drop.

Recommendation

Based on the above findings, the following recommendations are made;

1. Government should recruit and send teaching and non-teaching staff to schools in their number and quality.
2. Government should provide enough facilities to schools to facilitate teaching and learning. The Parent-Teacher Association should assist government in the provision of desks, books and even construct classroom blocks to assist the government provide the facilities required for learning in schools.
3. Motivation of staff is important in making the staff do their work diligently. Teachers in schools should be promptly paid their salaries and promoted in their due time. This will increase their commitment and make them happy doing their job.
4. Instructional supervision of students as they go about their academic activities should be intensive. Teaching job includes mentorship which covers guidance and counselling. Quality time should be adopted to mentorship in school as it helps to provide direction to students.
5. Finally, it is essential to note that as good as the quality assurance indicators could be, money or funding remains the only means of making them available in schools. It is hereby recommended that government should increase its funding of schools with good monetary allocation to schools.

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Budgetary Control and Financial Performance of Government Corporations: A Case of Water and Sanitation Corporation (WASAC)

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DOI: 10.29322/IJSRP.10.09.2020.p10559

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10559>

Abstract- To run any Government corporation, financial performance is required to enhance the use of budgetary control as a management tool to ensure performance. Nevertheless, returns on investment, net profit margin and return on asset as measure of profitability remains low because of unreliable financial performance within government corporations. Hence, the ignition of conducting a study to examine the effect of budgetary control on financial performance using specific objectives which are to assess the effect of budget variance on financial performance, to examine the impact of cost reduction on financial performance and to analyze the relationship between management support and financial performance. This study involved 86 respondents selected from 110 employees of WASAC in Nyarugenge District. Slovein formula was applied together with random sampling while choosing the number of respondents. Data were collected from respondents, cleaned and entered in SPSS version 21.0 to produce both descriptive statistic tables, correlation tables and regression analysis tables that have given the following results: ($r=.549$ and $sig=.000$), between budget variance and management support ($r=.789$ and $sig=.000$), between budget variance and net profit margin ($r=.582$ and $sig=.000$), between budgetary variance and return on asset ($r=.615$ and $sig=.000$), budgetary variance and return on investment ($r=.665$ and $sig=.000$), between cost reduction and management support ($r=.687$ and $sig=.000$), between net profit and return on investment ($r=.767$ and $sig=.00$), and return on assets and return on investment ($r=.943$ and $sig=.000$). The findings prove that budgetary control have a positive relationship with net profit margin because the coefficient of regression analysis indicates that all the calculated p-values are less than critical level of significance at 0.05. The results of regression analysis have also proved that to the established relationship between budget variance and net profit margin has $b=.016$ and $sig=.039$ which is less than 0.05 level of significance meaning that there is positive significant relationship. The second establishment of relationship is between cost reduction and net profit that indicates that there is a positive relationship because p-value is less than 0.05 level of significance ($b=.633$ and $sig=.000$), the third relationship established between management support and net profit margin showing that there is a positive significant relationship due to 0.02 calculated p-value which is less than 0.05 level of significance ($b=.335$ and $sig=.002$). Thus, the researcher recommends WASAC as a public corporation to increase budgetary control mechanisms by enhancing management

support, cost reduction and budget variance to ensure the progress of WASAC.

Index Terms- Budgetary control, Financial Performance, Government Corporation.

I. INTRODUCTION

Several nations in the world have got involved in detailed planning movements of various types of planning in the period and this has resulted in a wide range of literature on planning. Attention was paid to budgetary controls although this is generally recognized as the main instrument for allocating resources to specific recurrent and development activities. In recent years however, budget systems have received more attention and literature on public expenditure management has become more common. The budget is increasingly recognized as the key tool for economic management (Kiringai, 2002). It is nevertheless also recognized that a country can have a sound budget and financial system and still fail to achieve its intended targets; this reason that the rules of the game by which the budget is formulated and implemented are equally important and that they do influence outcomes (Schick, 2009).

In the European Union, the Maastricht Treaty on European Union of 1992 mandates reform of budgetary control of the member states to enhance fiscal discipline. Aspect of the budgetary control that has received considerable attention is the sequence of budgeting decisions. Traditionally, Congress voted on budget items line by line, or category by category. The sum of all spending approved by Congress emerged as the overall budget of the institution, a budgeting process called bottom up budgeting. The budget reforms stemming from the Budget Act of 1974 replaced this tradition with a different sequence. First, Congress voted on the total size of the budget. Once that was determined, Congress would allocate that total budget among spending categories of money. A budgeting process of that type is called a top-down process. It was argued at the time, that a top-down budgeting process would lead to a better outcome, in particular, to a smaller budget, than would a bottom-up budget process (Committee on the Budget, 2017).

In Canada, Budgetary control is a system of management control in which the actual income and spending are compared

with planned income and spending, so that the firm can make decisions if plans are being followed and if those plans need to be changed in order to make a profit. Budgetary control is the one of best technique of controlling, management and finance in which every institutional department's budget is made with estimated data. Then, the management conducts a comparative study of the estimated data with original data and fix the responsibility of employee if variance will not be favorable. Organizations can use budgetary control in forecasting techniques in order to make plan and budget for the future of the institution (Epstein and McFarlan, 2011).

In Kenya, budgetary control reforms have been attempted as far back as the early 1970s but the results have not been encouraging. In recent years, a key recommendation has been to shift the focus from the annual budget to a Medium-Term Expenditure Framework approach to budgeting. Kenya adopted the MTEF approach in 2000 and implemented it for the first time in the budget in June 2005 (Tsofa, Sassy & Godman, 2015). According to Kiringai (2002) the goals of adopting the MTEF approach was to achieve Fiscal discipline expenditure by line agencies must adhere to hard budget ceilings in order to remain within aggregate resource constraints. Allocate efficiency-expenditure allocation should address national development priorities and Operational (technical) efficiency of public expenditure should achieve explicit outputs at minimum cost by applying performance targets of output relative to inputs.

In Rwanda, budgetary control to the institutions generally as the collection of the formal and informal rules and principles governing the budgetary control within the executive and the legislature; institutions divide the budgeting process into different steps, determine who does what and when in each step, and regulate the flow of information among the various actors. In doing so, such institutions distribute strategic influence and create or destroy opportunities for collusion and for holding individual agents accountable for their actions (MINECOFIN Report, 2014) the constitutional role of the budgeting process is to provide a framework in which all competing claims on public funds are manifested and reconciled with each other.

This research project aims to identify how budgetary control can contribute to the financial performance of Government Corporation. For this purpose, study defines a research framework for assessing the contribution of budgetary control to the financial performance of Water and Sanitation Corporations (WASAC).

II. STATEMENT OF THE PROBLEM

Most government corporations do not effectively apply budgetary control techniques in financial performance (Needles, 2011). Hence, most of them have failed to recognize the power of budgets and budgetary control over performance outcomes of the corporations. The basic requirement for the success of budgeting is the absolute support and enthusiasm provided by top management to ensure cost reduction through their support which results in budget supervision and appropriate estimation of profit potentials in a business (Hingorani & Ramanathan, 2007).

There have been attempts to clarify the contribution of budgetary control on financial performance in Government corporations worldwide, specifically in studies conducted by Subramaniam and Ashkanasy (2011); Swieringa and Moncur

(2013) in Africa; Onduso (2013), Mohammed (2013) and Oduor (2012) in the region particularly in East Africa. However, literatures have shown that there are not much empirical studies conducted in the field of budgetary control and financial performance in Government corporations in terms of cost reduction, budget variance and management support specifically in WASAC of Rwanda.

Meantime, the reports of Audit General indicate that WASAC has distorted a budget of 20.1 billion and other 3.9 billion which was spent without supporting document though it was budgeted for, this report also highlighted that WASAC carries out project without doing feasibility study which shows that accounting tools like budgetary control are not applied in WASAC (OAG, 2019). This is another gearing fact that brings the researcher to prove whether the issue of financial challenges in government corporations in Rwanda, especially in WASAC are associated to poor financial management practices or budgetary control for the case of this study about budgetary control and financial performance.

Hence, the researcher conducted this study on WASAC to assess the confusion brought by Kenis (2012) who argued that budgetary control has a positive significant relationship with financial performance ($p=.895$ and $sig=.000$) whereas Milani (2011) found a weak positive relationship between budgetary control and financial performance ($p=.511$ and $sig=.010$) at 0.01 level of significance. With reference to no research in the field of budgetary control and financial performance was conducted in WASAC and the ambiguities brought by previous research in same field elsewhere as well as the absence of extensive research in this area and the report of audit general on WASAC, this research found out the relationship between budgetary control and financial performance of government corporation in Rwanda taking WASAC as a case of study.

III. OBJECTIVES OF THE STUDY

3.1. General objective

The main objective of the study was to assess the contribution of budgetary control to the financial performance of Government Corporation.

3.2. Specific objectives

The study was split up in the following specific objectives:

- (i) To determine the effect of budget variance on financial performance of WASAC.
- (ii) To assess the impact of cost reduction on financial performance of WASAC.
- (iii) To establish the relationship between management support and financial performance of WASAC

IV. LITERATURE REVIEW

4.1. Empirical review

Carolyn et al. (2007) examined the association between effects of budgetary control on performance, using a sample of large U.S. cities over 2003-04 timeframe. Within this context they examined whether the tightness of budgetary controls or effective level of budgetary control within the cities as measured by budget

supervision contribute to performance as measured by bond rating and found that effective level of budgetary control is significantly and positively related to bond rating with Pearson correlation of 0.761 and calculated significance value of 0.00 at 0.01 level of significance.

Wijewardena and Zoysa (2011) conducted a study in Australia to examine the impact of budgetary control on financial performance of Government Corporation. In their study, performance was measured by two financial indicators: sales growth and return on investment. Data was collected from two Government Corporation in Australia. The results showed a positive and significant relationship between budget variance and sales growth ($p=0.561$ and $sig=0.001$), and between budgetary control and sales growth ($p=0.611$ and $sig=0.001$) at 0.01 level of significance. The study also showed a significant relationship between budget variance and return on investment ($p=0.823$ and $sig=0.000$), between budgetary control and return on investment ($p=0.732$ and $sig=0.000$) at 0.01 level of significance.

Anthony (2013), study sought to evaluate budgetary control of public institution in Poland and see whether budgetary control has significant impact on performance of public firms. The budgetary controls of public corporations were assessed by using variables such as planning, coordination, control, communication and evaluation. The performance of public firms in Poland was examined by using Return on Assets. Based on the data extracted from public firms' financial statements, correlation coefficients of 0.786 and calculated significance value of 0.00 at 0.01 level of significance and regression analysis of ($b=0.0761$ and $sig=0.00$) at 0.05 level of significance showed that budgetary control have significant associations with the organizational performance of public firms in Poland. This confirms that efficient public firms maintain sound budgetary control which contributes to higher levels of organizational performance hence a positive relationship. Qing (2010) conducted a study on the impact of the budgetary control on performance of Government Corporation in China. The main objective for the study was to examine whether the budgetary control significantly and positively impacts the performance of Chinese Government Corporation. The findings showed that there was a positive effect of the budgetary control on public firm's performance ($p=0.876$ and $sig=0.000$) at 0.01 level of significance. First, the study revealed that budgetary control leads to higher sales revenue with a positive significant relationship ($b=0.865$ and $sig=0.000$) at 0.05 level of significance. Secondly, budget goal characteristics strongly affect the budgetary performance of Chinese public firms, thus clear budget goals lead to higher goal

achievement, whereas, difficult (but attainable) budget goals increase the motivation of employees to achieve budget standards at 78.6%. Thirdly, the study discovered that the more formalized budgetary control tends to lead to a higher growth in profit of public institution at 81.3% of progress.

Onduso (2013) conducted a study in Nairobi Kenya to examine the effect of budgetary control on financial performance of public institution. Findings showed that the financial performance as measured by ROA is strongly influenced by using budget variance and management support ($p=0.832$ and $sig=0.000$; $p=0.764$ and $sig=0.000$) at 0.01 level of significance respectively. Mohammed and Ali (2013) in a study the relationship between budgetary control and performance of public Remittance companies in Somalia concluded that the correlation between budgetary control and firm performance is 0.514, which means that one level increase of budgetary control effectiveness leads to 0.514 higher firm performance. The probability of this correlation coefficient occurring by chance is 0.00. This coefficient shows that a statistically significant moderate positive relationship between budgetary control and firm performance.

Faith (2013) conducted a study in Lagos Nigeria entitled the effects of budgetary control on financial performance of commercial and manufacturing parastatals in Nigeria. The aim of this study was to examine how budgetary affect financial performance of firms in Lagos. The key findings of this study showed that more formal cost reduction promotes higher growth of sales revenues in the parastatals, formal budgetary control leads to a higher growth of profit in parastatals and greater budgetary control leads to better managerial performance at rate of 78.9% of increment in growth of profit.

4.2. Conceptual framework

The conceptual framework is the foundation on which the entire research project is based. It identifies the network of relationships among the variables considered important to the study of a given problem. The dependent variable is financial performance of government corporation with the following indicators: net profit margin, return on assets (ROA), and return on investment (ROI), which can result into independent variable that is budgetary control with the following indicators: cost reduction, management support and budget variance. Variable that explains a relation or provides a causal link between other variables is called mediating variable or intervening variable. Indeed, in this study the intervening variable are financial control and government policies.

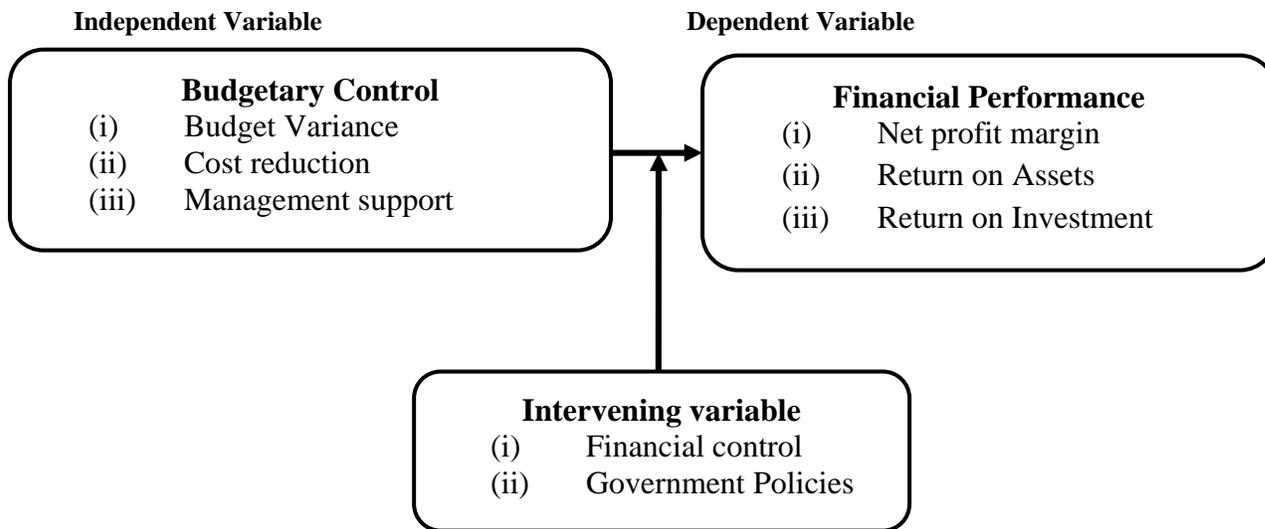


Figure 2. 1: Conceptual framework
Source: Researcher, 2019

Figure 2.1 indicates the relationships between variables under the study; those are budgetary control as measured by budget variance, cost reduction and management support; and financial performance of Government Corporation as measured by net profit margin, return on assets and return on investment. The conceptual model shows also the moderating/intervening variables which are others factors that may have an impact on dependent variables which are financial control and government policies.

V. RESEARCH METHODOLOGY

This study used descriptive survey as research design taking a quantitative approach. This research design is preferred because it helps to explain and explore the existing problem of budgetary control and financial performance within WASAC as a government corporation. This research assessed the contribution of budgetary control to the financial performance in WASAC headquarter as case study. It has been therefore, focusing on a population who are employees of this WASAC and Financial Controller. The 110 employees of WASAC are the people that are considered as target population of this study. The sample size of this study were drawn from 110 employees to became 86 respondents using Slovenia’s formula

$$n = \frac{N}{1 + Ne^2}$$

$$n = \frac{110}{1 + 110 (0.05)^2}$$

$$n = 86$$

Whereby n is the sample size, N is the total population and e is the error. By using this formula above when $e = 0.05$, $N = 110$ then sample size was 86 employees of WASAC.

The researcher used simple random sampling technique to select sample size that has been used in this study that aimed at assessing the relationship between of budgetary control and

financial performance of public institution. The simple random sampling was used because it was assumed to afford each element of the population the opportunity of having independent and equal chance of being represented in the sample of 86 respondents as the sample size. The researcher gained the information from the primary data obtained through a questionnaire, interview schedule and document review applied as to obtain secondary data. In data collection instruments, researcher used Questionnaire, interview schedule and document review.

In the data analysis procedures, researcher focused on the data analysis and the data presentation. In the data analysis, researcher used a real statistics program namely SPSS 21.0 version. By using this statistics program, researcher entered the data in the software then researcher started to assign a number to each response item, enter a clear code, clean data, and also produced descriptive statistics, correlation and regression analysis. In the data analysis, researcher presented the findings from the data by using the correlation and regression analysis to show the relationship between budgetary control and financial performance of WASAC.

VI. RESEARCH KEY FINDINGS

6.1. The effect of budget variance on financial performance of WASAC

This subsection considers the perceptions and views of respondents about the effect of budgetary control on financial performance in terms of the actual revenues, budgeted revenues, actual service cost, material price, labor rate variance, material usage variance and labor efficiency variance. The respondents indicated their responses in relation to the statements on effect of budget variance on financial performance of WASAC measured using 1-5 Likert Scale (1- strongly disagree, 2- disagree, 3- neutral, 4- agree, 5-Strongly agree).

Table 6.1: The budget variance and financial performance of WASAC

Statement	1	2	3	4	5
The actual revenues should be more than the budgeted revenues to enhance financial performance	1(1.2%)	7(8.1%)	29(33.7%)	34(39.5%)	15(17.4%)
The budgeted or planned revenues should be less than the budget to enhance financial performance	1(1.2%)	2(2.3%)	7(8.1%)	54(62.8%)	22(25.6%)
The actual service cost should be less than the amount budgeted for the period	1(1.2%)	6(7.0%)	35(40.7%)	28(32.6%)	16(18.6%)
Material price variance affects negatively financial performance	1(1.2%)	1(1.2%)	8(9.3%)	36(41.9%)	40(46.5%)
Labour rate variance affect negatively financial performance	1(1.2%)	3(3.5%)	41(47.7%)	12(14.0%)	29(33.7%)
Material usage variance affects financial performance	1(1.2%)	1(1.2%)	27(31.4%)	21(24.4%)	36(41.9%)
Labour efficiency variance affects financial performance	1(1.2%)	13(15.1%)	39(45.3%)	15(17.4%)	18(20.9%)

Source: Primary Data (2019)

The results in Table 6.1 indicate that 54 (62.8%) of total respondents agreed that budgeted revenues should be less than the budget to enhance financial performance, 34 (39.2%) of total respondents have agreed that the actual revenues should be more than the budgeted revenues to enhance financial performance, 40 (46.5%) of the total respondents strongly agreed that material price variance negatively affects financial performance, 39 (45.3%) of total respondents strongly agreed that labor efficiency variance affects financial performance, 36 (41.9%) of total respondents strongly agreed that material usage variance affects financial performance, whereas 41 (47.7%) of total respondents kept neutral on the statement that labor rate variance affect negatively financial performance, and 35 (40.7%) of total respondents kept neutral on the statement that the actual service cost should be less than the amount budgeted for the period. Hence, the results prove that budgetary variance affects financial performance because the rate of strongly agree and agree is above 60% from the views and perception of respondents on the given statements.

In an interview conducted with Chief Budget Manager at WASAC Head Quarter in Nyarugenge, he mentioned that due to some challenges that are encountered during Budget execution period regarding budgetary control, WASAC has put up strategies to enhance budgetary control in order to increase financial

performance of WASAC Head Quarter in Nyarugenge. He stated in his own words:

“To solve issues that hinder financial performance in relation to budget variance and control, we decided to keep budgeting and forecasting very flexible to incorporate actual revenues is greater than budgeted revenues to enhance financial performance. To ensure its success story we involve the whole budgeting team so that profit target and cash flows are well recorded to increase credibility and bookkeeping services to support budgetary control and financial performance”. This statement from the interviewee indicates that budgetary control in terms of budget variance affect financial performance of WASAC Head Quarter in Nyarugenge District

6.2. The impact of cost reduction on financial performance of WASAC

The respondents indicated their responses in relation to the statements on the impact of cost reduction on financial performance of WASAC measured using 1-5 Likert Scale (1- strongly disagree, 2- disagree, 3- neutral, 4- agree, 5-Strongly agree).

Table 6.2: The cost reduction and financial performance of WASAC

Role of cost reduction	1	2	3	4	5
Pressure on profits	5(5.8%)	16(18.6%)	4(4.7%)	4(4.7%)	57(66.3%)
Careful use of resource	1(1.2%)	12(14.0%)	22(25.6%)	18(20.9%)	33(38.4%)
Increase productivity	29(33.7%)	12(14.0%)	9(10.5%)	4(4.7%)	32(37.2%)
Desire to be the best in business	32(37.2%)	13(15.1%)	2(2.3%)	8(9.3%)	31(36.0%)
Motivate the employees to render and sell service/products	10(11.6%)	14(16.3%)	3(3.5%)	32(37.2%)	27(31.4%)

Source: Primary Data (2019)

The results in Table 4.4 show that 57 (66.3%) of total respondents strongly agreed that pressure on profits is one among other impact of cost reduction on financial performance, 48 (55.8%) of total respondents strongly agreed that increase completion ensures financial performance, 33 (38.3%) of total respondents strongly agreed that careful use of resource also

indicate the impact of cost reduction on financial performance, 32 (37.2%) of total respondents strongly agreed that increase productivity and 31 (36.0%) of total respondents strong agreed that desiring to be the best in business can also enhance the impact of cost reduction on financial performance. Thus, implies that the

rate of both strongly agreed and agreed responses show that cost reduction affects financial reduction.

The third interviewee states that: “Since the start WASAC desired to be the best service provider public corporation but careful use of resources remains a challenge that hinders this kind of desire. In viewpoint, budget is a tool to promote careful use of resources and on the other hand it promotes financial performance”. This statement indicates that the interviewee supports with the study findings indicating that desire to be the best in business and careful use of resources have a great impact

on financial performance of WASAC Head Quarter in Nyarugenge District of Rwanda

6.3. The relationship between management support and financial performance of WASAC

The respondents indicated their responses in relation to the statements on the relationship between management support and financial performance of WASAC measured using 1-5 Likert Scale (1- strongly disagree, 2- disagree, 3- neutral, 4- agree, 5- Strongly agree).

Table 6.3: Role of management in cost reduction to enhance financial performance

Role of management in cost reduction to enhance financial performance	1	2	3	4	5
Originate the goals of cost reduction	4(4.7%)	18(20.9%)	2(2.3%)	4(4.7%)	58(67.4%)
Consolidate cost reduction activities into a single organisational function	24(27.9%)	14(16.3%)	10(11.6%)	6(7.0%)	32(37.2%)
Assign responsibilities for the achievement of cost reduction to specialist	2(2.3%)	26(30.2%)	5(5.8%)	15(17.4%)	38(44.2%)
Formulate broad policy guidelines for cost reduction implementation	4(4.7%)	4(4.7%)	6(7.0%)	7(8.1%)	65(75.6%)
Communicate enthusiasm for the cost reduction	3(3.5%)	6(7.0%)	8(9.3%)	6(7.0%)	63(73.3%)
Measure the effect of cost reduction	2(2.3%)	4(4.7%)	6(7.0%)	8(9.3%)	66(76.7%)
Budget the money that will be spent for cost reduction	1(1.2%)	4(4.7%)	7(8.1%)	7(8.1%)	67(77.9%)
Place control on cost reduction	3(3.5%)	5(5.8%)	7(8.1%)	7(8.1%)	64(74.4%)

Source: Primary Data (2019)

The results in Table 6.3 indicate that 68 (79.1%) of total respondents strongly agreed that management support help to budget the money that will be spent for cost reduction in order to enhance financial performance, 67 (77.9%) of total respondents strongly agreed that management support help to measure the effect of cost reduction to enhance financial performance, 67 (77.9%) of total respondents strongly agreed that management support help to place control on cost reduction to enhance financial performance, 66 (76.7%) of total respondents strongly agreed that management support defines the scope of cost reduction to enhance financial performance, 65 (75.6%) of total respondents strongly agreed that management support formulates broad policy guidelines for cost reduction implementation, 63 (73.3%) of total respondents strongly agreed that management support communicate enthusiasm for the cost reduction to enhance financial performance, 38 (44.2%) respondents strongly agreed that management support assign responsibilities for the achievement of cost reduction to specialist, and 32 (37.2%) respondents strongly agreed that management support consolidate cost reduction activities into a single organizational function. Thus, this implies that most of the respondents agreed or strongly agreed

that management support impact financial performance.

Table 6.4: Correlation Analysis between Budgetary Control and Financial Performance

		budget Variance	Cost Reduction	Management Support	Net Margin	Profit Return Asset	on Return Investment	on
budget Variance	Pearson Correlation	1	.549**	.786**	.582**	.615**	.665**	
	Sig. (2-tailed)		.000	.000	.000	.000	.000	
	N	86	86	86	86	86	86	
Cost Reduction	Pearson Correlation	.549**	1	.687**	.848**	.703**	.756**	
	Sig. (2-tailed)	.000		.000	.000	.000	.000	
	N	86	86	86	86	86	86	
Management Support	Pearson Correlation	.786**	.687**	1	.741**	.778**	.834**	
	Sig. (2-tailed)	.000	.000		.000	.000	.000	
	N	86	86	86	86	86	86	
Net Profit Margin	Pearson Correlation	.582**	.848**	.741**	1	.713**	.767**	
	Sig. (2-tailed)	.000	.000	.000		.000	.000	
	N	86	86	86	86	86	86	
Return on Asset	Pearson Correlation	.615**	.703**	.778**	.713**	1	.943**	
	Sig. (2-tailed)	.000	.000	.000	.000		.000	
	N	86	86	86	86	86	86	
Return on Investment	Pearson Correlation	.665**	.756**	.834**	.767**	.943**	1	
	Sig. (2-tailed)	.000	.000	.000	.000	.000		
	N	86	86	86	86	86	86	

** . Correlation is significant at the 0.01 level (2-tailed).

Source: Primary Data, 2019

The findings in Table 4.9 prove that there is a significant relationship between budget variance and cost reduction (p=.549 and sig=.000), between budget variance and management support (p=.786 and sig=.000), between budget variance and net profit margin (p=.582 and sig=.000), between budgetary variance and return on asset (p=.615 and sig=.000), budgetary variance and return on investment (p=.665 and sig=.000), between cost

reduction and management support (p=.687 and sig=.000), between net profit margin and return on investment (p=.767 and sig=.00), and return on assets and return on investment (p=.943 and sig=.00). Hence, the results show that there is a positive significant relationship between budgetary control and financial performance

Table 6.2: Coefficients of Budgetary Control and Net Profit Margin

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.082	.099		.828	.410
budget Variance	.016	.077	.018	.204	.039
Cost Reduction	.633	.072	.642	8.742	.000
Management Support	.335	.106	.314	3.168	.002

a. Dependent Variable: Net Profit Margin

Source: Primary Data, 2019

The findings of Table 4.12 prove that budgetary control has appositive relationship with net profit margin because the coefficient of regression analysis indicates that all the calculated p-values are lesser than 0.05 significance level; basing on the coefficient of regression model, $Y = \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta$ and it becomes $Y = .082 + 0.16x_1 + .633x_2 + .335x_3 + \beta$. Thus, the model demonstrates that there is a significant relationship between budgetary control and net profit margin within WASAC.

The first relationship established between budget variance and net profit margin (b=.016 and sig=.039) demonstrates a significant relationship because the .039 calculated p-value is less

than the 0.05 level of significance. The second relationship established between cost reduction and net profit margin (b=.633 and sig=.000) demonstrates that there is a positive significant relationship because the calculated .000 p-value is less than 0.05 level of significance. And the thirst relationship established between management support and net profit (b=.335 and sig=.002) indicated that there is a positive significance relationship between the two because the calculated p-value .002 is less than 0.05 level of significance. This implies that there is a relationship between budgetary control and net profit margin in WASAC.

Table 6.2: Coefficients of budgetary control and return on asset

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error			
(Constant)	.258	.102		2.542	.013
budget Variance	.000	.079	.000	.002	.008
Cost Reduction	.268	.075	.319	3.600	.001
Management Support	.508	.109	.559	4.667	.000

a. Dependent Variable: Return on Asset

Source: Primary Data, 2019

The findings of Table 4.15 prove that budgetary control has a positive relationship with return on asset because the coefficient of regression analysis indicates that all the calculated p-values are less than 0.05 significance level. Basing on the coefficient of regression model, $Y = \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta$ and it becomes $Y = .258 + .000x_1 + .268x_2 + .508x_3 + \beta$. Thus, the model demonstrates that there is a significant relationship between budgetary control and return on asset within WASAC.

The first relationship established between budget variance and return on asset (b=.000 and sig=.008) demonstrates a significant relationship because the .008 calculated p-value is less

than the 0.05 level of significance. The second relationship established between cost reduction and return on asset (b=.268 and sig=.001) demonstrates that there is a positive significant relationship because the calculated .001 p-value is less than 0.05 level of significance. And the third relationship established between management support and return on asset (b=.508 and sig=.000) indicated that there is a positive significance relationship between the two because the calculated p-value .000 is less than 0.05 level of significance. This implies that there is a relationship between budgetary control and return on asset in WASAC.

Table 6.3: Coefficients of Budgetary Control and Return on Investment

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error			
(Constant)	.168	.083		2.027	.853
budget Variance	.012	.065	.016	.185	.046
Cost Reduction	.283	.061	.347	4.658	.000
Management Support	.512	.089	.583	5.780	.000

a. Dependent Variable: Return on Investment

Source: Primary Data, 2019

The findings of Table 4.12 prove that budgetary control has a positive relationship with return on Investment because the coefficient of regression analysis indicates that all the calculated p-values are less than 0.05 significance level; basing on the coefficient of regression model, $Y = \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta$ and it becomes $Y = .168 + .0126x_1 + .283x_2 + .512x_3 + \beta$. Thus, the model demonstrates that there is a significant relationship between budgetary control and return on investment within WASAC.

The first relationship established between budget variance and return on investment (b=.012 and sig=.046) demonstrates a significant relationship because the .046 calculated p-value is less

than the 0.05 level of significance. The second relationship established between cost reduction and return on investment (b=.283 and sig=.000) demonstrates that there is a positive significant relationship because the calculated .000 p-value is less than 0.05 level of significance. And the thirst relationship established between management support and return on investment (b=.512 and sig=.000) indicated that there is a positive significance relationship between the two because the calculated p-value .000 is less than 0.05 level of significance. This implies that there is a relationship between budgetary control and return on investment in WASAC.

VII. CONCLUSION AND RECOMMENDATIONS

7.1. Conclusion

This study is about budgetary control and financial performance in Government Corporation, it was limited on budgetary control with its predictors such as budget variance, cost reduction and management support; and financial performance of Government Corporation as measured by net profit margin, return on assets and return on investment. Literatures have shown that researchers like Carolyn *et al.*; (2007) examined the association between effects of budgetary control on performance, using a sample of large U.S. cities over 2003-04 timeframe, and found that effective level of budgetary control is significantly and positively related to bond rating with Pearson correlation of 0.761 and calculated significance value of 0.00 at 0.01 level of significance. Another study of Wijewardena and Zoysa (2011) conducted a study in Australia to examine the impact of budgetary control on financial performance of Government corporation revealed that there is a positive and significant relationship between budget variance and sales growth ($r=0.561$ and $sig=0.001$), and between budgetary control and sales growth ($r=0.611$ and $sig=0.001$) at 0.01 level of significance. The study also showed a significant relationship between budget variance and return on investment ($r=0.823$ and $sig=0.000$), between budgetary control and return on investment ($r=0.732$ and $sig=0.000$) at 0.01 level of significance.

Thus, the findings of this study revealed that there is a significant relationship between budget variance and cost reduction ($r=0.549$ and $sig=0.000$), between budget variance and management support ($r=0.789$ and $sig=0.000$), between budget variance and net profit margin ($r=0.582$ and $sig=0.000$), between budgetary variance and return on asset ($r=0.615$ and $sig=0.000$), budgetary variance and return on investment ($r=0.665$ and $sig=0.000$), between cost reduction and management support ($r=0.687$ and $sig=0.000$), between net profit and return on investment ($r=0.767$ and $sig=0.000$), and return on assets and return on investment ($r=0.943$ and $sig=0.000$). This implies that there is significant relationship between budgetary control and financial performance in WASAC. Hence, to ensure financial performance one has to first improve budgetary control

7.2. Recommendations

Basing on the study findings, the researcher would like to recommend to WASAC as a public corporation to increase budgetary control mechanisms by enhancing management support, cost reduction and budget variance to ensure the progress of WASAC. Hence, WASAC managers should ensure that appropriate financial resources are available, accessible and aligned with budget; these managers of WASAC also need to implement budgetary control for profit maximization, return on Asset and return on Investment

Basing on the study findings, the researcher would like to recommend to the Government to ensure that the entire government corporation have separate budget, well controlled and well presented to the ministry in charge, office of ombudsman and office of Auditor General and reported on each phase of expense

to better track the likely hindrances for effective budgetary control.

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Identifying Potential Clues On Covid-19 Through Coronavirus-Related Literature Using A Data-Driven Approach With The Help Of A Text Mining-Based Software, PredictSearch.

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DOI: 10.29322/IJSRP.10.09.2020.p10560

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10560>

Abstract- Huge amounts of scientific publications are produced daily in particular in many fields of medicine and biological science. Managing these data and deducing valuable information to identify significant clues to understand a physiological or pathological mechanism as well as to propose therapeutic solutions are urgently needed. Here we describe the use of a dedicated text mining-based software, PredictSearch (PS) to explore, through a literature survey, significant correlations between terms related to coronavirus infection. Our search highlighted some features of antiviral compounds such as chloroquine and glycyrrhizin and their impacts on apoptotic cell death, cell cycle and endocytic pathway in the course of coronavirus infection. In addition, the reported mechanisms through which the virus can avoid the interferon-induced antiviral state should pave the way to identify efficient therapies. This study demonstrates the importance of informatics tools such as PredictSearch dedicated to scientific literature survey to adapt previous knowledge to new health issues on a particular topical subject like Covid-19 pandemia.

Index Terms- SARS-CoV2, literature search, text mining

I. BRIEF PREDICTSEARCH DESCRIPTION

PS allows determining links between biological terms and/or molecules (genes, proteins, metabolites, chemical compounds) within title/abstracts of publications of the PubMed database. Title or abstracts quoting at least one gene were all collected as at the beginning, its main use was to decipher the impact of gene modulation evaluated by transcriptomic analysis (microarray). Then, these titles/abstracts were submitted to text mining through an anti-dictionary that removes terms not biologically relevant or, taken alone, too general such as "repair", "synthesis", "expression", "DNA", "protein", "cells".... However, these terms were stored in a specialized data base named "generic words" within a specific dictionary. Moreover our anti-dictionary preserves meaningful concepts defined as a series of terms, even those including "generic words" (e.g. "interferon expression", "DNA repair"). Iterative searches start by dropping within our working window either one or several genes of our gene data base

(right panel in figure 1) or a particular term/concept using the "Search" tab (left panel in figure1). The "Annotate" tab allows to see all the terms/concepts (either classified by *p-value*, number of publications or alphabetical order) correlated with the term(s)/gene(s) selected in the working window. Like for genes, each of these terms found in either one or all dictionaries can be dropped into the working window and new correlation searches with these added terms can be performed. At the bottom of the screen, the "Abstracts" tab lists all the publications in which selected terms are co-cited.

II. ANTIVIRAL MOLECULES RELATED TO CORONAVIRUS

In the present study, we choose two key words as baits: "coronavirus" and "antiviral" (Fig.1). At first, selecting only "coronavirus" led to the identification of 2704 words present in dictionaries encompassing terms of biological process, "customizable words" (issued from biological dictionaries), generic words, composed words (series of words) and key words (all terms that were not retained by the anti-dictionary and absent in the other dictionaries). Adding the term "antiviral" reduced the number of words to 185 (Fig.1). Among those exhibiting a *p* value <0,05, in addition to angiotensin (*p* value=3e-03) and interferon (*p* value= 1e-02), the top thirty words contained chemical or herbal compounds such as "glycyrrhizin" (*p* value= 3e-06), "PLPRO" (papain-like protease, *p* value= 8e-05), 6-azauridine (*p* value= 4e-04), nelfinavir (*p* value= 4e-03), and chloroquine (*p* value= 2e-02). In order to avoid missing publications that did not contain a gene name, search for title/abstracts citing a combination of the selected terms was performed on all PubMed. Noteworthy, glycyrrhizin, nelfinavir, chloroquine were all co-cited in a study of 2006 launched to evaluate several potential antivirals against SARS coronavirus infections (1).

Selecting "coronavirus", "antiviral" and "glycyrrhizin" led to 6 publications (1, 2, 3, 4, 5, 6). Glycyrrhizin is one of the constituents of glycyrrhiza glabra (liquorice) root. Animal and in vitro studies demonstrated a reduction of viral activity in herpes simplex virus encephalitis and influenza A virus pneumonia, and revealed antiviral activity against HIV-1, SARS related coronavirus, respiratory syncytial virus, arboviruses and vesicular

stomatitis virus. Of different compounds (ribavirin, 6-azauridine, pyrazofuridin or mycophenolic acid), glycyrrhizin was the most active in inhibiting replication of the SARS-associated virus (6). 6-azauridin was cited only in the title/abstract of two more publications (7, 8). While a search for "nelfinavir" with "coronavirus" and "antiviral" identified 4 publications (1, 9, 10, 11), 27 publications were found quoting in their titles/abstracts our baits and "chloroquine". Moreover, 15 were published in 2020, none in 2019, but no more than one per year was listed for the period between 2003 and 2018. The earliest report in 2003 (12) was focused on the observation that astrocytes were the major targets for mouse hepatitis virus (MHV) persistence. It showed also that expression of the pro-apoptotic Bnip3 gene was reduced following MHV infection and that chloroquine significantly inhibited the repression of Bnip3 promoter activity induced by the acidic-pH dependent MHV mutant OBLV60 (Fig.2). The next publication in 2004 (13) reported that chloroquine phosphate induced a significant antiviral activity in vitro in cells infected with the severe acute respiratory syndrome coronavirus (SARS-CoV).

III. CHLOROQUINE ACTIVITIES

The first publication mentioning a therapeutic effect of chloroquine phosphate on COVID-19 patients appeared on March 2020 (14). The same month, two other publications evaluated the use of chloroquine against COVID-19. One can be considered as the first evidence that hydroxychloroquine was more potent than chloroquine to inhibit SARS-CoV-2 in vitro (15). The second reviewed the different activities involved in the antiviral activity of chloroquine (16). This last publication prompted us to add to our query, terms like: "quinone reductase"; "sialic acid"; "alkalinization"; "endosome"; "glycosylation" and "p38 MAPK" using the search tab.

Keeping chloroquine as the common bait, a search for terms correlated with "endosome" led to identify 2407 terms, with "glycosylation" 665, with "sialic acid" 201 and with "alkalinization" 196. The most significant gene shared among all these terms was *NEU1* (neuraminidase 1), which codes for a lysosomal enzyme that cleaves terminal sialic acid residues from substrates such as glycoproteins and glycolipids. Interestingly, "neuraminidase" was also co-cited with "coronavirus" in 48 publications (the earliest being published in 1976). Neuraminidase inhibitors are a class of drugs that block the viral neuraminidase enzyme of the influenza virus by preventing its budding from the host cell (17).

Genes that were cited with either "coronavirus", "glycyrrhizin" and "chloroquine" led separately to 609, 503 and 2001 genes, respectively. However, only few genes were co-cited with at least two of these terms.

CASP8 (caspase 8) encodes a member of the cysteine-aspartic acid protease (caspase family). This protein is involved in programmed cell death (apoptosis) induced by various apoptotic stimuli such as stress triggered by UV irradiation, reactive oxygen species (ROS), but also by bacterial or viral infection. *CASP8* was one of the caspases activated by canine coronavirus (CCoV) and this activation results in apoptosis (18). Similarly, apoptosis together with *CASP8* activity was increased in cells infected with the equine coronavirus (19). However, glycyrrhizin was reported

to induce apoptosis through *CASP8* activation and TP53 increase (20).

CTSB (cathepsin B) encodes a member of the C1 family of peptidases. One proteic product generated by this gene is a lysosomal cysteine protease with both endopeptidase and exopeptidase activity that may play a role in protein turnover. It has been shown that the ability of different strains of feline coronavirus to infect cells were highly dependent of host cell *CTSB* activity for entry into the host cell as well as on the low pH of endocytic compartments (21). It was suggested that host cell cathepsins may play a role in the distinct tropisms displayed by different feline coronavirus biotypes. An inhibition of *CTSB* expression and a stabilization of lysosomal membranes by the biologically active metabolite of glycyrrhizin, 18beta-glycyrrheticin, which can prevent free fatty acid-induced lipid accumulation and cell apoptosis in vitro, were observed (22).

BCL2 (Bcl2 apoptosis regulator) encodes an integral outer mitochondrial membrane protein that blocks the apoptotic cell death. It has been shown that canine coronavirus type II decreased Bcl2 expression in cytosol (23). Moreover, expression of the SARS-CoV nucleocapsid (SARS-CoV N) protein was reported to down-regulate *BCL2* levels and to induce apoptosis (24). On the other hand, Parris (25) proposed an interesting hypothesis that linked *BCL2*, chloroquine and coronavirus. Indeed, chloroquine facilitates apoptosis of abnormally persistent T-cell clones by suppressing NF-kappa-B, which enhances the expression of anti-apoptotic proteins such as *BCL2*. Based on this observation, one may hypothesize that prophylactic exposure to pro-apoptotic chloroquine drugs caused natural selection for strains of viruses and other parasites that have enhanced anti-apoptotic abilities. Hence, drugs that suppress *BCL2* or restore TP53 function might be effective in restoring the parity of resistance to apoptosis between infected and uninfected cells. Similarly to chloroquine, 18beta-glycyrrheticin acid can induce apoptotic cell death at least in part through reducing *BCL2* level (26).

TP53 encodes a transcriptional factor that responds to various cellular stresses to regulate expression of target genes resulting in cell cycle arrest, apoptosis, senescence, DNA repair, or changes in metabolism. Although apoptosis induced by coronavirus infectious bronchitis virus was shown to be independent of TP53, infection imposed a growth-inhibitory effect on cultured cells by inducing a cell cycle arrest at S and G(2)/M phases (27). However, depending on the cellular models, an activation of TP53 pathway and a suppression of cell growth by chloroquine were reported (28).

Furthermore, chloroquine and hydroxychloroquine were also known as potent inhibitors of autophagy, a process that performs the self-digestion of damaged cells to generate ATP and other essential biosynthetic molecules to temporarily avoid cell death (29). In addition to raise the lysosomal pH (30), chloroquine may block the fusion between autophagosomes and lysosomes through its ability to disorganize golgi and endosomal systems (31). Autophagy inhibition induces an endoplasmic reticulum stress that in turn initiates apoptosis (Fig. 2). Although in the case of viral infection, autophagy can be either proviral or antiviral (32, 33), it was shown that the viral nsp6 protein of different coronaviruses including severe acute respiratory syndrome virus activates autophagy (34). Although like apoptosis, autophagy can be considered as an antiviral defense at the early step of viral

infection, viruses can subvert and exploit, later on, multiple steps of the autophagic pathway to evade immune responses and facilitate viral replication (reviewed in 35). It has been demonstrated that autophagy is required for the formation of complexes resulting from the binding of coronavirus hepatitis virus (MHV) to double membrane vesicles (DMVs) and that DMV formation significantly enhances the efficiency of the virus replication (36). However, MHV replication or release might depend neither on the autophagic factor ATG-5, by which cells deliver DMVs containing cytoplasm or cytoplasmic organelles to the lysosome, nor on an intact autophagic pathway (37). The controversial involvement of autophagy in viral replication may depend on the type of viruses used or cells tested as well as on the different techniques used in studying autophagy.

Nevertheless, autophagosomes that are produced during autophagy fuse with the endosomal pathway (Fig. 2). The endocytic pathway is used for CoVs to enter host cell towards the participation of the subunit viral protein S2 (38). The first publication co-citing "coronavirus" and "endocytic pathway" appeared in 2001 (39) and concerned the human coronavirus HCoV-229E. Since then, several studies have firmly established the role of the endocytic pathway in controlling the virus entry into the host cell.

IV. IMPACTS OF SARS-CoV/ACE2 INTERACTION

It has been reported that chloroquine, known to inhibit acidification of endosomes during the events of replication and infection (15), exhibited an antiviral effect either before or after exposure to SARS-CoV through interfering with terminal glycosylation of the cellular receptor, angiotensin-converting enzyme 2 (ACE2). From 325 PubMed reports containing "SARS-CoV" and "angiotensin-converting enzyme", 155 were published up to the end of April 2020. ACE2, expressed in a variety of tissues including both the upper and lower respiratory tract, myocardium and the gastrointestinal mucosa (40), is the main receptor for coronavirus entry into cells (Fig. 3). Moreover, SARS-CoV2 may also infect endothelial cells (41), which indeed express ACE2 (42). The TNF-alpha converting enzyme (TACE) activated by the spike protein of SARS-CoV (SARS-S protein) was found to promote ACE2 ectodomain shedding (Fig. 3), and therefore the entry of SARS-CoV as well as TNF production (43). Loss of ACE2 that is translocated from the cell surface to endosomes after binding to the SARS-S protein, might lead to several deleterious events (Fig. 3). While ACE2 exhibits anti-inflammatory activity, ACE2 deficiency results in vascular inflammation and an inflammatory response that contributes to atherosclerotic plaque formation (44). These events relied on the activity of ACE2, which is involved in the conversion of angiotensin 1 into angiotensin 1-9 and production of the vasodilator 1-7 angiotensin from angiotensin 2. Indeed, ACE2 can block its homolog ACE inhibiting the conversion of angiotensin 1 into angiotensin 2 (Fig. 3). Loss of ACE2 will therefore lead to an increase of angiotensin 2 and as a consequence to vasoconstriction, elevation of blood pressure and ROS production through NADPH oxidase activation (45). It can be speculated that at the site where vasoconstriction occurs, TNF release and/or atherosclerotic plaque inducing inflammatory cytokines will trigger endothelial barrier dysfunction. Disruption

of the endothelial barrier will affect pulmonary alveoli, required for gas exchange causing ultimately acute respiratory distress syndrome (ARDS), a syndrome that is known to be the main cause of the mortality of SARS-CoV 2 infected patients. Moreover, pulmonary infection with the human SARS-CoV in mice led to an ACE2-dependent myocardial infection with a mark decrease in ACE2 expression (46), which, as described above, will result in deleterious effects due to angiotensin 2 accumulation (Fig.3).

V. INTERFERON PATHWAY AND CORONAVIRUS INFECTION

The endocytic pathway may be even more important in our understanding of the CoVid-19 syndrome considering it can be associated with IFN resistance (Fig. 4). Tan et al. (47) tested several drugs in culture for their antiviral ability against SARS-CoV, including neuraminidase inhibitors and showed complete inhibition of cytopathic effects for some interferon (IFN) subtypes and human leukocyte interferon- α .

However, it was well established that SARS-CoV employs multiple passive and active mechanisms to avoid induction of type I interferons in cells. Loss of an efficient IFN response is likely to contribute to the establishment of a viremia early in infection. By contrast, high secretion of chemokines such as IP-10 and IL-8 might be responsible for massive immune cell infiltrations found in the lung of infected patients and the dysregulation of adaptive immunity (48).

Coronavirus can evade from the IFN system through several distinct mechanisms. Indeed, the antiviral effect of IFN relies in part on the expression of the 2'-5' Oligo adenylate synthetase (OASE). This enzyme, once activated by double strand (ds) RNAs, synthesizes 2'-5' oligo adenylates (2'-5'A), which as dimers or tetramers stimulate the dsRNA dependent-RNase L leading to the degradation of cytoplasmic and viral RNAs (Fig. 4). However several viruses exhibit a 2'-5' phosphodiesterase-like activity such as the viral protein ns2 of the coronavirus MHV, which confers virulence by cleaving 2'-5' A resulting in no activation of Rnase L (49, 50). In addition to the viral inhibition of the 2'-5'A/Rnase L system, it was shown that in SARS-CoV infected fibroblasts, no detectable induction of IFN- β occurs (51, 52, 53).

On the other hand, it was reported that absence of IFN- β results from the loss of activation of IRF3 (IFN regulatory factor 3), which is essential for IFN- β production (54). IRF3 synthesis is achieved through the combined activities of different factors (RING-1, MDA-5, PKR) activated in response to 5'triphosphorylated single stranded (ss) RNA or dsRNA (Fig. 4). It was suggested that loss of IRF3 might result from the impaired sensing of coronavirus by pathogen recognition receptors (PRRs) such as TLRs (Toll like receptors). One hypothesis was that dsRNA replication intermediates are located within the double membrane vesicles whose formation are induced, as we mentioned earlier, by virus infection and consequently will be protected from PRR sensing (54). Noteworthy, in contrast to coronavirus RNA, sensing with the IFN-inducer poly (I:C), polyinosinic:polycytidylic acid, a synthetic double strand RNA, resulted in IFN- β transcription and intranasal treatment with poly (I:C) was found to protect aged mice from lethal respiratory virus infections (55). It has to be noticed that whereas myeloid dendritic

cells (mDCs) and fibroblasts failed to produce IFN, plasmacytoid cells (pDCs) in the course of MHV infection are able to produce type I IFNs towards TLR7 (56). Noteworthy, elderly women had reduced number of pDCs and reduced TLR7/8 response compared to young adults (57). In contrast, seric markers involved in inflammation were increased in elderly and high levels of IL-6 correlated with increased morbidity and mortality were observed (58). Altogether these results are reminiscent of the observations that elderly with Covid-19 disease were indeed more prone in a context of a cytokine storm to respiratory illnesses resulting in higher mortality rates in such a population.

VI. CONCLUSIVE REMARKS

Investigating associated terms with "coronavirus" and "antiviral", PredictSearch allowed to identify within the literature several antiviral drugs or biological molecules including chloroquine and glycyrrhizin. Iterative queries highlighted different processes that might suggest how the virus can counteract at an early step the cellular defenses. Indeed, modulation of cell growth and induction of apoptosis are two common strategies used by many viruses to regulate their infection cycles. As other viruses, coronavirus infection leads at first to the induction of a cellular stress in the host cell. This stress has to be considered as a protective response of the host cell to avoid virus propagation through the induction of cell growth arrest and apoptosis. However, we report a hypothesis to explain how cellular resistance to apoptotic cell death might allow selecting some cells to survive and to constitute an important virus reservoir after cell recovery. It is suggested that the anti-viral activity of chloroquine or glycyrrhizin relies in part on their ability to induce apoptosis of the infected cells that were selected to survive. However this apoptosis will be triggered by events distinct from those induced at first by the viral stress. For instance, chloroquine can induce lysosomal stress and provoke a TP53-dependent cell death that does not require caspase-mediated apoptosis (59). Therefore, according to the inhibitory effect of chloroquine on autophagy and its ability to induce apoptosis, the benefit of the treatment should be considered in a time window when the virus alters these events for its survival and spread. The resulting impact of chloroquine on autophagy should also reduce not only the viral induced formation of cytoplasmic vesicles such as DMVs but also provoke alkalization of these subcellular structures leading to the degradation of viral RNA replication intermediates. Moreover, localization of these intermediates within DMVs avoids viral sensing, an event crucial for an induced IFN expression in different cell types with the exception of pDCs, which are reduced in elderly. It can be speculated that to bypass the reduced expression of IFN in the course of coronavirus infection, use of poly (I/C) that in contrast to dsRNAs induces IFN expression, can be a therapeutic option in combination with an anti-IL6 treatment. Other factors downstream of IFN can also be proposed to provide an antiviral state such as 2'-5'A that can be combined with poly (I/C) together with an inhibitor of 2'-5' phosphodiesterase activity of the viral ns2 protein to avoid 2'-5'A degradation and Rnase L inactivation.

Thus, we believed that the correlations found by PredictSearch analysis based on existing knowledge might highlight important tracks to speed the identification of therapeutic

approaches helping to fight new syndromes like Covid-19. More generally, this work illustrates how dedicated computational tools respond to the urgent need to deal with an exponential increase of publications.

ACKNOWLEDGMENTS

We are indebted to Dr. Michel Khrestchatsky for critically reading the manuscript and to Genex Laboratories that provided a free access to PredictSearch.

CONFLICTS OF INTEREST

The authors declare no conflict of interest

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Legends of figures:

Figure 1: Screenshot capture of main PredictSearch features.

Figure 2: Schematic representation of the terms/concepts correlated to apoptosis, endocytic pathway, autophagy and coronavirus. Legends are indicated on the top right of the figure in a gray box.

Figure 3: Schematic representation of the terms/concepts correlated to ACE2 pathway and SARS-CoV infection. See figure 2 for legends.

Figure 4: Schematic representation of the terms/concepts correlated to interferon and viral infection. See figure 2 for legends.

Figure 1

The screenshot displays the PredictSearch v 2.6.3 interface. At the top, the menu bar includes File, View, Select, Stat, Tools, and Help. Below the menu, there are search options: AND, OR, NOT, UN, and a search mode dropdown set to Full mode. The main workspace shows a network diagram with nodes representing terms and genes. Nodes are color-coded: red for selected terms (CORONAVIRUS, SARS-COV, ANTIVIRAL), green for correlated terms (GLYCYRRHIZIN, INTERFERON, ABCA4, IFNG), and blue for correlated genes (ACE, ACE2, BCL2, CASP8, CTSB, IFNG, etc.). Red-hatched nodes represent uncorrelated terms (QUINONE REDUCTASE, STALIC ACID, NEURAMINIDASE, etc.).

Annotations on the interface include:

- « Search » tab to look for one particular term or concept**: Points to the search bar.
- Access to dictionaries**: Points to the 'Dictionaries' section on the left.
- Selected terms**: Points to the red nodes in the network.
- correlated terms**: Points to the green nodes.
- correlated genes**: Points to the blue nodes.
- uncorrelated terms**: Points to the red-hatched nodes.
- Gene data base**: Points to the table on the right.
- Words correlated to selected terms**: Points to the table at the bottom left.
- Links to related publication**: Points to the 'Abstracts' table at the bottom right.

Gene data base table:

Gene ID	Symbol
13	AADAC
17	AAVS1
24	ABCA4
5243	ABCB1
1636	ACE
59272	ACE2
56	ACRV1
60	ACTB
6868	ADAM17

Words correlated to selected terms table:

Word	NArt	*p
GLYCYRRHIZIN	3	3e-06
REPLICATION	5	3e-05
PLPRO	2	8e-05
VIRUS	6	1e-04

Abstracts table:

Read	PubMed ID	Title	Date	Nge
18852458		A noncovalent class of papain-like protease/deubiquitinase inhibitors blocks SARS virus replication.	2008	4
18427249		Recent antiviral strategies against human coronavirus-related respiratory illnesses.	2008	1
18321765		Interferon and cytokine responses to SARS-coronavirus infection.	2008	1
17944271		Severe acute respiratory syndrome coronavirus entry as a target of antiviral therapies.	2007	2

Figure 2

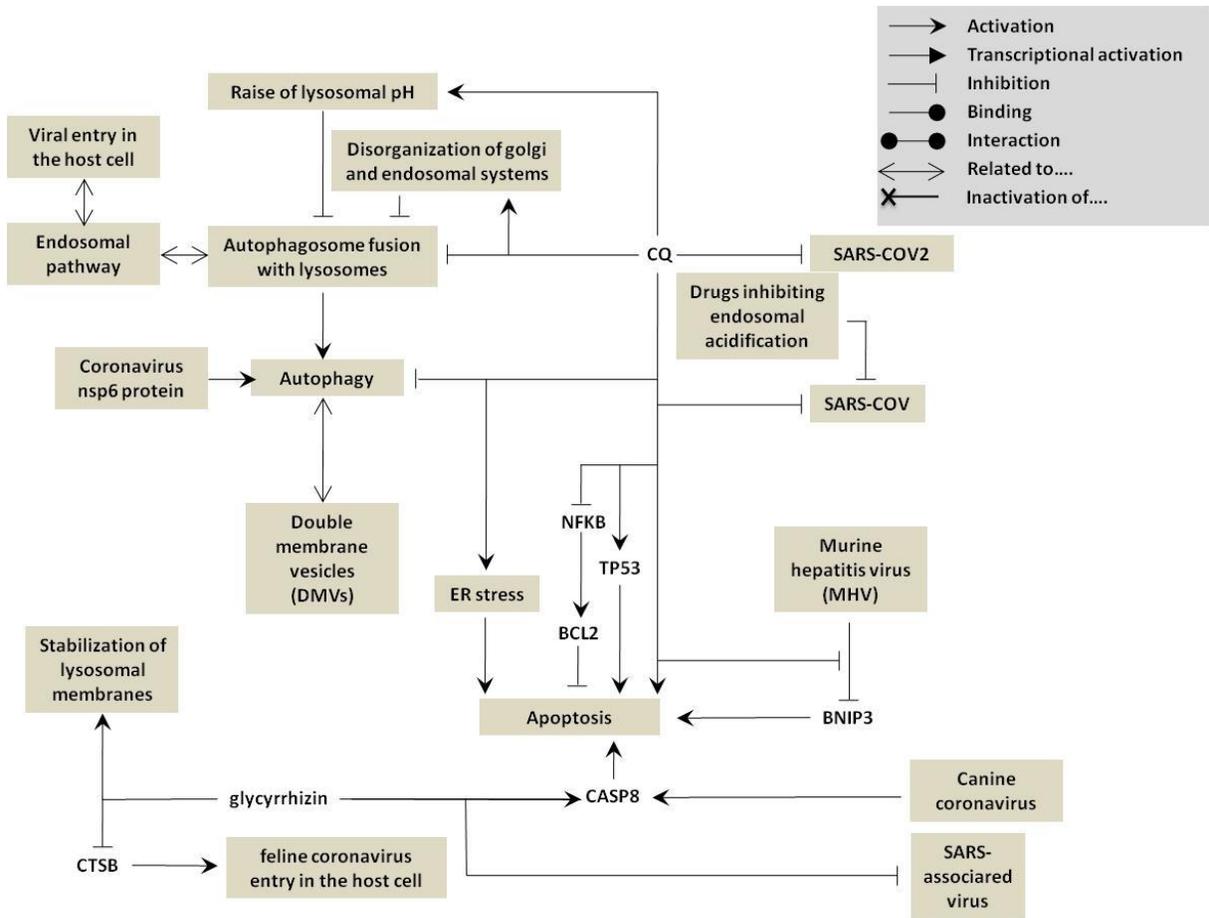


Figure 3

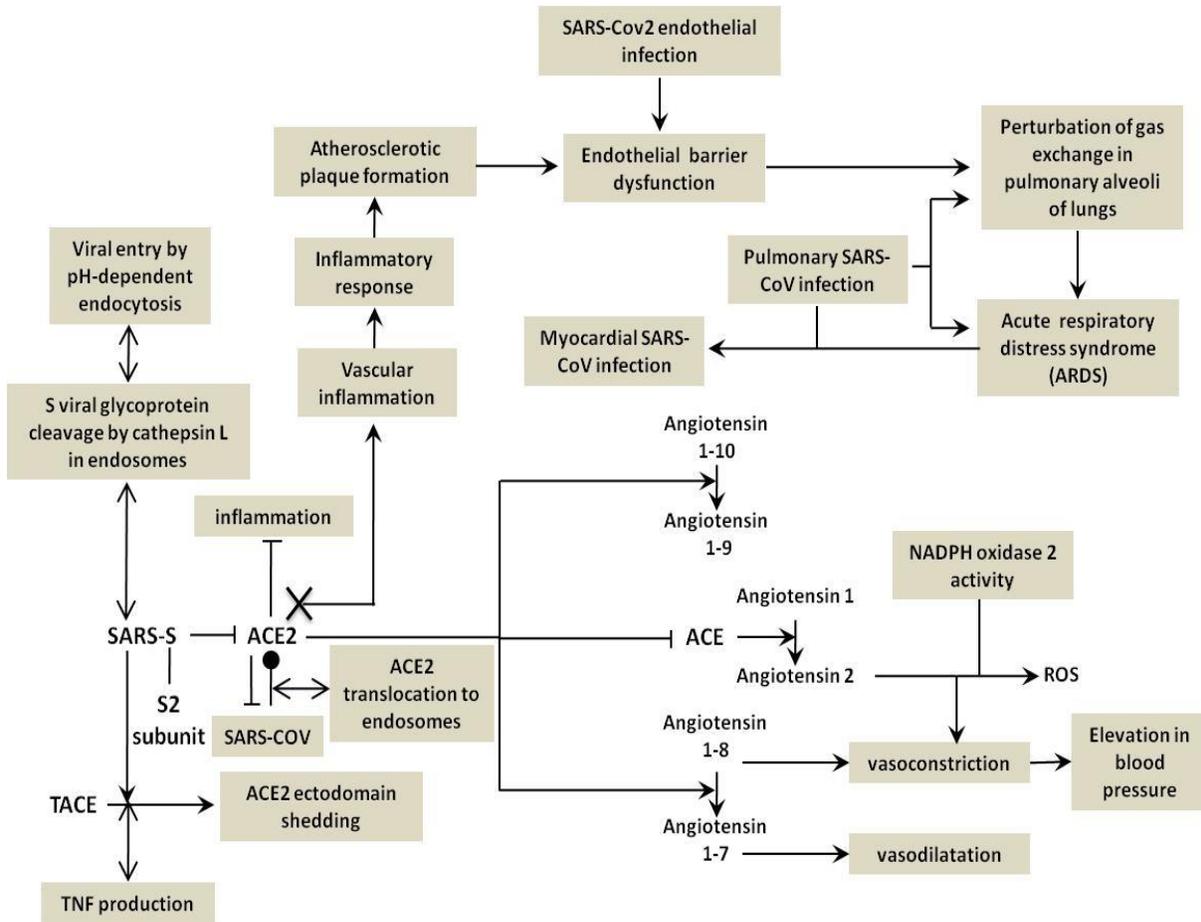
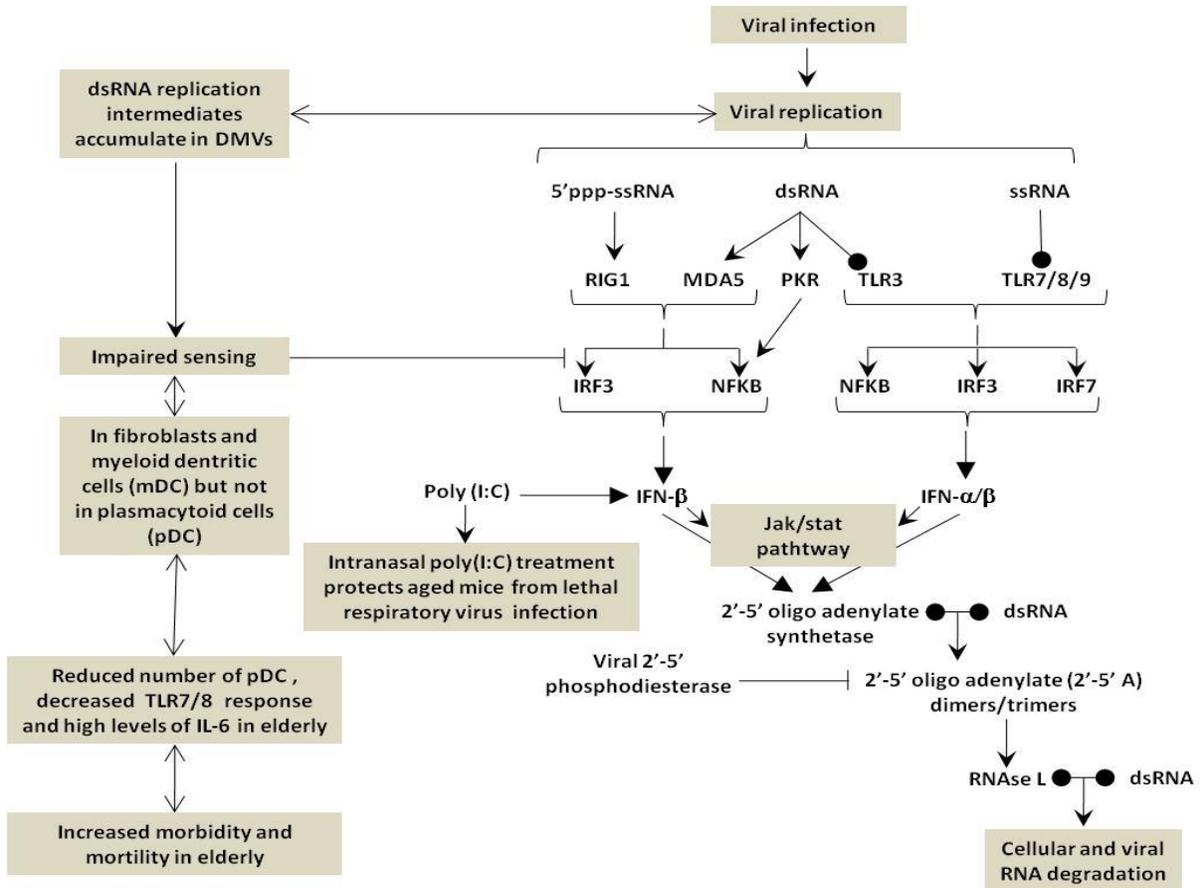


Figure 4



Effect of Financial Soundness on Firm Value of Listed Commercial Banks in Kenya

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DOI: 10.29322/IJSRP.10.09.2020.p10561
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10561>

Abstract- Over the last few years, commercial banks in the country have been recording poor performance especially in terms of their profitability. Based on this fact, the key aim of this research study was to examine the impact of financial soundness on firm value of listed commercial banks in Kenya. A descriptive study design was adopted for the purpose of this study. The study population comprised of the eleven (12) publicly listed commercial banks at NSE using census. Secondary data obtained from the CBK as well as other published financial reports of the targeted 12 commercial banks were used. The period which the current study aimed to investigate was the last ten financial years from 2009 to 2018. In analysing the study results, a multiple linear regression model was used by the researcher and SPSS Version 22 package was used to generate the relevant regression tests. Finally, researcher presented the obtained regression results using charts and frequency tables for ease interpretation. The study found that bank liquidity has negative and insignificant effect on bank firm value ($\beta = -0.089$, $t = -.248$, $p > 0.05$). The study found that capital adequacy has a positive and significant effect on bank firm value ($\beta = .059$, $t = .502$, $p < 0.05$). The study found that asset quality relates positively to banks firm value ($\beta = 12.892$, $t = 3.927$, $p < 0.05$). The study finally found that earnings positively and significantly affect banks firm value ($\beta = .579$, $t = 1.350$, $p < 0.05$).

Index Terms- Financial Soundness, Commercial Banks, Firm Value

I. INTRODUCTION

Banks play a very crucial role in the overall economic development of countries because they have significant control over the supply of money in circulation; hence, they are the key stimuli of economic progress. Therefore, banks are very important since they foster economic growth through capital facilitation. This means that, for banks to be in a position to

facilitate sufficient capital to its customers, they must be financially stable, healthy and sound (Ifionu & Keremah, 2016). This is so because the financial sectors across the globe are normally faced with various crisis on daily basis as institutions in this sector strives to undertake their daily activities. Globally, commercial banks constitute significant part of the banking structure in majority of the countries. In Pakistan for instance, the overall economic development of the country depends entirely on the key role that commercial banks are embroiled in including mobilization of savings, projects financing, as well as enhancing both internal and external trade. In Palestine, the country's monetary authority has over the years worked hard to reform credit its accessibility amongst Palestine's.

In Kenya, commercial banks are usually exposed to various risks both internally as well as externally. Financial risk facing Kenyan banks tend to impact their financial performance as well as their sustainability in the long-run. This means that Kenyan commercial banks need to employ appropriate measures of risk management in order to mitigate against these risks and improve their overall performance. This is because, various extreme challenges have over the year's characterized majority of the banking sectors across the globe, which has been attributed to high risk, associated with the services they provide (Adjei-Frimpong, 2017). For instance, in Kenya, numerous and extreme challenges have been witnessed in the banking sector in the last few years such as liquidity/credit crisis, failure of some banks, bail-out schemes among banks, banks recapitalization as well as serious issues in their overall management as was the cases with Chase and Imperial banks (Ifionu and Keremah, 2016). Therefore, there was a need to undertake the current study in order to examine the effect of financial soundness on firm value of listed commercial banks in Kenya.

II. PAST STUDIES

Odunga et al (2018) did a study in Kenya that investigated the efficiency of forty commercial banks that operated in Kenya between 2005 and 2011 by specifically focusing on their liquidity and capital adequacy. The results from the study established that banks with sufficient assets and more cash flow creates more confidence to its customers compared to banks experiencing cash flows problems since they are able to settle their obligation with ease. The study recommended that commercial banks need to fully comply with various requirements imposed by the CBK especially in regards to capital adequacy requirement.

Loutskina, (2019) carried out an empirical review that assessed how commercial banks securitize and liquidate their short-term assets in Kenya. From the study results, the researcher found out that banks use their internal funds when the interest rate is hiked rather than seeking for external loans and paying the same with interest. The study results also found out that commercial banks that had securitized and had internal funds to use rather than to borrow risked their financial stability.

Kibuchi, (2019) in his study investigated how liquidity risk affect the financial performance of commercial banks in Kenya. This study used four years data between 2010-2014. The study results revealed that bank's profitability was determined by their liquidity risk. In event that the customers are not provided with the information on time, pertaining their funds, they lose confidence and this may affect the banks reputation which may eventually affects the firm's performance.

Njeru (2016) conducted a survey on liquidity management and its influence on financial performance of the DTM. Descriptive research design was used in this study. It was found out that effective liquidity management was only attainable if the financial sector is well regulated whereas decision on liquidity was established to be statistically significant, hence, could be utilized in explaining how DTM perform financially.

Cheluget, Gekara, Orwa, and Keraro, (2018) carried out a study in Kenya to assess whether liquidity is a major determinant of financial distress among insurance firms. The study adopted a survey study design with sample size being determined using a stratified random sampling technique. The targeted study population consisted of forty-five insurance firms, which were already under the registration of IRA as at the end of the year 2012. Primary data was gathered from the targeted population using open-ended questionnaires. From the study results, the researcher concluded that there exists a significant relationship between the firm's liquidity and their financial distress; hence, it is a potential determinant of the insurance firm's financial distress in Kenya.

Gudmundsson, Ngoka and Odongo, (2018) also conducted a survey in Kenya whose objective was to examine the role played by capital adequacy in determining competition and stability of thirty-six commercial banks in Kenya for the period between 2001 to 2011. Lerner Index, Panzer, and Rosse H-statistics were utilized in the study to establish the existing competition among the selected commercial banks. From the approximations results obtained using the statistical measures, it was found out that competition amongst commercial banks in Kenya has over the years reduced significantly. It was also established that as core capital increased, it resulted into less

competition up to a given point from which competition increases.

Yahaya, Mansor and Okazaki (2016) in their survey indicated that capital adequacy is a key indicator that helps firm more so banks to assess their risk mitigation strategies that firms can adopt in order to improve their performance in a given economy. The study found out that in any country the capital adequacy determines the performance of firms though they are closely related.

Anjili (2016) inspected the elements influencing the management of advantage and obligation of business banks in Kenya identified with money related execution. This investigation discovered that a little decrease in operational proficiency can prompt high decrease in benefits and that expanded salary enhancement prompts expanded money related execution, keeping other components steady.

Cheruiyot (2016) led an examination in Kenya to set up how resource quality influences gainfulness of business bank. The investigation uncovered that advantage quality was essentially identified with productivity of Commercial Banks in Kenya in a positive route since the proportion of non performing resource for net resources was seen as low. Non-performing credits results to wastage of time, exertion and assets. It results to a backhanded expense to the bank because of the low resource quality. The bank in this manner won't gain premiums on the advances and in since quite a while ago run; it contrarily influences the benefit of the bank.

III. METHODOLOGY

A. Research Design

The current study adopted a descriptive research design in assessing the objectives of the study. As Creswell and Creswell (2017) purports, a descriptive research design is very useful while undertaking a study because it allows an in-depth assessment to be conducted of all the study variables. Descriptive research design was very useful for the purpose of this survey, as it allowed the researcher full description of the existing situation in regards to the study objective, hence, ensuring that fewer errors was encountered in the course of data collection.

B. Target Population

The target population were commercial banks listed in NSE. According to NSE (2018) there were 11 banks listed under NSE. All commercial banks listed in NSE, were involved in this study.

C. Data Collection Instruments

The researcher utilized secondary data for all publicly listed commercial banks in Kenya. Using this information was very important as it made the research to be undertaken with ease and it reduced research costs since it used another scholar's information to achieve present objective. Data was obtained from published bank's annual audited reports, from banks websites as well as internet for the period between 2009 and 2018, which was equivalent to ten years. The reason for choosing 2009 to 2018 period was that most of the banks experienced financial crisis during 2007-2008, hence, it was reasonable to examine value of commercial banks during the ten years post-financial crisis period.

D. Data Analysis and Presentation

Panel data was used to ensure that enough data was available for the purpose of this study because it contained both time series and cross-sectional dimensions thus, minimal biasness in parameter estimators. Regression results were generated using SPSS version, which gave results that are more detailed. The main aim of regression analysis was to summarize survey data thus, allowing for ease establishment of the connection that exists between the study variables. The following regression equation was developed for the purpose of analysis of this study.

$$Y_{it} = \beta_0 + \beta_1 X_{it} + \dots + \beta_n X_{it} + \epsilon$$

The econometrics model was extracted from the above equation as follows:

$$Y_{it} = \beta_0 + \beta_1 CA_{it} + \beta_2 BL_{it} + \beta_3 Aq_{it} + E_{it} + \epsilon_{it}$$

Y_{it} = ROE = Firm Value

β_0 = level of firm value

$\beta_1, \beta_2, \beta_3$ = Regression coefficients

CA_{it} = Capital Adequacy

BT_{it} = Bank Liquidity

Aq_{it} = asset quality

E_{it} = Earnings

ϵ_{it} = Error i=

Name of Bank (1...11)

t = Time (2008—2018)

IV. RESULTS AND DISCUSSIONS

A. Descriptive Statistics

The results show that the analysis was based on data from 11 listed banks in Kenya. The mean capital adequacy was 1.965, the mean of liquidity was 0.500, EBIT was 0.255, asset quality was 0.094 and that of Tobin Q was 4.891. The means portray a high levels of 6.027 and 6.367 in the years 2009 and 2010 and then a slight decrease to 5.341 in 2011. The scores take a further dip in 2012 to 2014 (.248, .205 and .186 respectively). The years 2016 to 2018 are characterized by rising values of 0.256, 0.371 and 0.396 respectively.

Capital Adequacy	N	Minimum	Maximum	Mean	Std. Deviation
CA9	11	0.14	33.1	6.027	12.937
CA10	11	0.14	36.92	6.367	13.740
CA11	11	0.14	29.18	5.341	11.452
CA12	11	0.17	0.32	0.248	0.050
CA13	11	0.16	0.24	0.205	0.027
CA14	11	0.14	0.22	0.186	0.027
CA15	11	0.14	1	0.258	0.246
CA16	11	0.12	0.94	0.256	0.228
CA17	11	0.07	1.8	0.371	0.522
CA18	11	0.15	1.81	0.396	0.519
Overall				1.965	3.975

B. Diagnostic Tests

Multicollinearity

As the variance of an estimator increases, also collinearity increases. A rule of thumb is that if VIF > 10 then multicollinearity is relatively high (Gujarati, 2014).

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	3.456	.419		8.242	.000		
CAA	.059	.020	.502	2.992	.024	.963	1.038
EBIT	.579	.429	.227	1.350	.226	.957	1.045
LM	-.089	.357	-.042	-.248	.812	.931	1.075
AQ	12.892	3.283	.669	3.927	.008	.935	1.070

a. Dependent Variable: TQ

Heteroskedasticity

Null hypothesis was no heteroscedasticity in data if the probability was greater than 5%.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.209	.167		1.252	.257
CAA	-.001	.008	-.059	-.175	.867
EBIT	-.051	.171	-.101	-.298	.776

LM	-.217	.142	-.525	-1.524	.178
AQ	.675	1.307	.178	.516	.624

a. Dependent Variable: AbsUt

In the table 14.81 the p-value for capital adequacy was 1.867, EBIT was .776, liquidity management was .178 and asset quality was 0.624 which is greater than the significance level thus absence of heteroscedasticity.

C. Inferential Statistics

Autocorrelation Test

		Capital Adequacy	Earnings Before Interest and Tax	Liquidity Management	Asset Quality	Tobin Q
Capital Adequacy	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	11				
Earnings Before Interest and Tax	Pearson Correlation	-.112	1			
	Sig. (2-tailed)	.743				
	N	11	11			
Liquidity Management	Pearson Correlation	.013	-.171	1		
	Sig. (2-tailed)	.971	.616			
	N	11	11	11		
Asset Quality	Pearson Correlation	.156	-.031	-.194	1	
	Sig. (2-tailed)	.646	.928	.568		
	N	11	11	11	11	
Tobin Q	Pearson Correlation	.581	.158	-.205	.749**	1
	Sig. (2-tailed)	.061	.643	.546	.008	
	N	11	11	11	11	11

** Correlation is significant at the 0.01 level (2-tailed).

From the findings, it was clear that there was positive correlation between the variables capital adequacy and liquidity (0.013), asset quality and capital adequacy (0.156), Tobin Q and capital adequacy, EBIT and asset quality (0.581, 0.158 and 0.749 respectively). On the other hand, there was negative correlation between the variables EBIT and capital adequacy (-0.112), liquidity management and EBIT (-0.171), asset quality and liquidity (-0.194) and finally liquidity and Tobin Q (-0.205). The findings imply that, there is some evidence of multicollinearity among the explanatory variables.

Regression Analysis

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.915 ^a	.837	.729	.23044

a. Predictors: (Constant), Asset Quality, Earning Before Interest and Tax, Capital Adequacy, Liquidity Management

The study found that the model explained 83.7% of the variance in firm value of commercial banks in Kenya as shown by the R². This implies that, Asset Quality, earnings before Interest and Tax, Capital Adequacy, Liquidity Management explain 83.7 percent of the variance in firm value of commercial banks in Kenya for the period under review.

Analysis of Variance (ANOVA)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.638	4	.410	7.712	.015 ^b
	Residual	.319	6	.053		
	Total	1.957	10			

a. Dependent Variable: Tobin Q

b. Predictors: (Constant), Asset Quality, Earning Before Interest and Tax, Capital Adequacy, Liquidity Management

The F Test of 7.712 indicates that the regressions explanatory power on the overall significance was strong. The significance value of 0.0151 obtained implies that the regression model was significant as it was less than $\alpha = 0.05$.

Regression Coefficient

Model	Unstandardized Coefficients		Standardized Coefficient	Sig.
	B	Std. Error	Beta	
(Constant)	3.456	.419		8.242.000
Capital Adequacy	.059	.020	.502	2.992.024
Earnings Before Interest and Tax	.579	.429	.227	1.350.226
Liquidity Management	-.089	.357	-.042	-.248.812
Asset Quality	12.892	3.283	.669	3.927.008

a. Dependent Variable: TQ

The coefficients results from the regression model in table 4.11 shows that holding Asset Quality, Earning Before Interest and Tax, Capital Adequacy, Liquidity Management constant at zero, firm value of listed commercial banks in Kenya will be 3.456. A unit increase in Capital Adequacy will lead to 0.059 units' increase in firm value, a unit increase in Earnings before Interest and Tax will lead to 0.579 increase in firm value, a unit increase in Liquidity Management will lead to a -0.089 decrease in firm value and a unit increase in asset quality will lead to 12.892 increase in firm value.

From the model coefficients, the following model was developed;

$$y = 3.456 + 0.059X_1 + 0.579X_2 - 0.089X_3 + 12.892X_4$$

where y is trade facilitation, X₁ Capital Adequacy, X₂ Earnings Before Interest and Tax, X₃ Liquidity Management and X₄ Asset Quality.

V. CONCLUSION

Overall, the results fully support the pecking order, liquidity and buffer theories of the study Pecking order theory encourages companies to prioritize on its financing options by first utilizing all internal funds before going to other external financing option a fact which allows such firm to generate sustainable profit and avoid diluting effect. Therefore, a financing needs to exist within an organization given the fact that debts are meant to boost the internal finances that a firm already has. The liquidity theory emphasises is on efficiency of an organization cannot be simply improved by its liquidity alone. This can be assessed from the fact that numerous commercial banks such as Imperial and Chase banks which have been faced with significant issues had a higher liquidity but they were not financially sound. Therefore, the Liquidity Preference Theory informs the variable of bank liquidity for the purpose of this study. The buffer theory is based on encouraging firm's particularly commercial banks to hold sufficient liquid reserves which they can be able to utilize in the event where they are faced with financial distress. This with minimum capital requirement, a commercial bank will be in position to remain in a stable position despite it experiencing low liquidity. This is because, lack of buffer capital might simply cause a commercial bank to experience financial distress.

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Sustainable hydropower development, environmental protection and affordable electrification in Rwanda.

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DOI: 10.29322/IJSRP.10.09.2020.p10562

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10562>

Abstract-The world is quickly turning into a global town because of the expanding day by day necessity of energy by all residents over the globe while the world in its structure can't change. The requirement for energy and its related services to fulfill human social and financial growth, welfare and wellbeing is expanding. Rwanda also is moving fast for its development in all sectors most especially energy sector which is a key in the development. Back to renewable in sustaining power as well as environmental protection and affordable electricity to all are an overwhelming approach in meeting energy demand of future generations. The study highlights the current status of hydropower development as renewable energy, environmental protection and accessible electricity in Rwanda.

Hydropower is an important renewable energy resource worldwide likewise in Rwanda too, since it is the largest generating power by 47% of all the total renewable energy in the country.

Even though the country has tried a tremendous job in sorting out the shortage of power but electricity is still scarce and unaffordable as shown in this article and environmental destruction as well. With the development of hydropower leads to sustainable power to overcome major issues like environmental destruction due to largely usage of biomass (charcoal and firewood), even access to electricity and its affordability is inevitably get solved. A sustainable hydropower project is achievable, yet requires appropriate planning and cautious system design to deal with difficulties. Fine planned hydropower projects can add to provide sustainable energy. A latest acquaintance is essential for energy planners, sponsors, and different partners to settle on educated choices concerning hydropower projects. This is essentially a review paper. Aside from utilizing professional information, the authors have additionally consulted widely from journals, reports and a few records to get secondary data regarding the topic. The study suggested various measures and policy recommendations which when regarded as would assist attain the aspiration of sustainable hydroelectricity thus to promote environmental protection and provide affordable electrification for the whole country.

Key words: hydropower development, environmental sustainability, affordable electricity and clean energy.

I. INTRODUCTION

Hydropower or hydroelectricity is basically referred to as the conversion of energy from flowing water into electricity. It is viewed as a sustainable power source in light of the fact that the water cycle is continually restored by the sun [1]. The African mainland is portrayed by a low charge pace of simply above 40% and for each capita utilization of just 180 kWh in sub-Saharan Africa (barring South Africa), compared to the 2,674 kWh global average electricity consumption. Electricity is essential for economic and social development [2].

Rwanda's hydroelectric power is the leading source of renewable energy with an average of 47% of the total renewable energy supplied in the whole country followed by thermal energy source with 27%. Rwanda's capacity part has become quickly over the previous decade, with power now available to the greater part of Rwandans in their homes, up from 10% in 2009, according to the World Bank Rwanda Economic Update, Lighting Rwanda. Blackouts have become shorter and less successive, the aftereffect of enormous interests in the area, the report says.

While Rwanda is on the right track for increasing access to electricity, the report indicates that the cost of electricity supply is among the highest in the region where by the electricity tariffs are ranging between US\$0.12 and US\$0.28 per kWh thus makes electricity unaffordable for most households and industry in general. It remains a constraint for the country's economic and industrial development. "Rwanda happened to be a leader in the push to give inexpensive, trustworthy and sustainable electric power to all residents in Africa," said Yasser El Gammal, Rwanda's World Bank Country Manager. "The challenge over the next five years will be to ensure that the electrification program remains affordable to the government". The Rwandan government perceives the basic job of power access in quickening monetary turn of events, just as improving wellbeing results and ways of life for residents. The National Strategy for Transformation plans to give all inclusive access to solid power by 2024. To that end, the report brings up that the legislature has executed a few changes changing the power organization into an industrially worked, state-possessed endeavor, and the private part has appeared as a strategic investment partner [3].

Around the world, about 3 billion individuals cook with biomass

on customary wasteful ovens. This practice has particularly harmful effects on health and environment. Firewood collection and charcoal production are worldwide significant contributors to forest degradation and to deforestation respectively, the carbon emissions from wood fires is responsible for an estimated 18% of the global warming process and the agricultural residues used as cooking fuel are not going back to soil for fertility anymore.

Rwandan families go through as long as 6 hours out of each day gathering kindling and up to 33% of their revenues for their energy needs, worsening the cycle of poverty. National wide, About 79.9% of households use firewood as their primary cooking fuel and 93% of rural household utilize firewood as it is considered in most cases still abundantly accessible, in excess of a portion of the kindling stoves working across the nation are 3-stones stoves. Approximately 65% of households living in major urban areas like Kigali, Huye and Rwamagana use charcoal to meet most of their cooking needs through both traditional and improved cook stoves [4]. The above factors affect the environment through deforestation leads to soil erosion, landslide, climate change and air pollution it is noted by world health organization that household air pollution is one of the leading causes of disease and premature death in the developing world [5]. This can be mitigated by having availability of sustainable electricity nationwide.

II. METHODOLOGY

Methodology used to carry out this research is based on quantitative information and data attained from government documents, published research papers, authenticated websites, outlooks on sustainable hydroelectric power development and environmental protection, local and international organizations' reports and thesis. The international organizations include World Bank, International Renewable Energy Agency, and world health organizations. The emphasis is on the sustainable hydropower development, environmental protection as well as affordable electrification in Rwanda [6],[7].

III. HYDROPOWER DEVELOPMENT IN RWANDA.

A. Brief overview of energy generation

Rwanda's electric power supply is made up of home generation, imported power from neighboring nations and regional shared power plants. The electricity utilized in the country comes from the accompanying sources: hydropower plants, solar energy,

methane gas, thermal power plants. So as to tackle the issue of power deficit known recently, the nation leased thermal power plants as temporary arrangement [8].

B. Hydropower development

Hydropower is regarded as the major source of Rwanda's electricity generation, over the last years, hydropower sector in Rwanda illustrated a remarkable improvement. Currently total installed capacity of power is about 226.7 MW, hydropower contributing 48.3% of it. The Involvement of private sector though investing in the energy field was the priority that marked the tangible achievements; Independent Power Producers (IPPs).

There are 35 hydropower plants that are grid connected with the supply capacity of 109.712MW. They incorporate shared and national power plants. Hydropower contributes about 48.3% of the whole installed capacity. Hydropower plants are freely possessed and managed by the government, rented to privately owned businesses, or IPP. The publicly possessed energy sources are supervised by the state utility Rwanda energy group (REG) under one of its two branches, energy utility corporation limited (EUCL). They incorporate bigger plants, for example, Mukungwa, Nyabarongo I and Ntaruka. 5 power plants (10 MW) are owned and operated IPP. Another 8 power plants with capacity of 13 MW are privately worked through renting concurrences with the Government of Rwanda.

Presently in Rwanda there exist a so called isolated networks totaling to 11 micro hydropower plants where initially started by the country and later gave it to private entities to expand the participation of private sector in power generation. Also there is pico hydropower plants ranging between 1 and 10 KW that are either government owned or managed and utilized by local communities or can even be completely private [9].

C. Impact of hydropower and other renewable energies.

- Access to electricity

In recent times, Rwanda has made an incredible effort throughout the Electricity Access Roll-out Program (EARP) whereby access to electricity has raised in June 2012 from 364,000 households to 590,000 households (24% of the total) by June 2016. This continued to act as the power backbone, providing power to large users and driving economic growth. Illustrated in figure 1

Figure 2: Levels of household consumption (Source EDPRS 2).

After three years, currently, 51% Rwandan households have access to electricity, connected to the national grid (37%) or through off-grid systems (14%). As the target is 100% access to electricity, a national electrification plan has been elaborated to ensure that this target is reached

The national plan’s approach on accessible electricity is that 52% of the entire population will be linked via grid extension whereas 48% will be linked via off-grid. Presently 14% is off-grid connected power [8].

IV. AFFORDABILITY OF ELECTRICITY.

The population growth rate is highly increasing, currently the population is approximately 13 million and it is expected to

almost double the population in 2050 indicated by Worldometer through population forecast as shown by the figure 3 [11, 12]. While Rwanda is on the right track for increasing access to electricity the report indicates that the cost of electricity supply is among the highest in the region where by the electricity tariffs are ranging between US\$0.12 and US\$0.28 per kWh thus makes electricity unaffordable for most households and industry in general. It remains a constraint for the country’s economic and industrial development [3]. This simply means that a lot of work is required to be done in terms of power generation most especially in hydropower sector due to its simplicity, less expensive and long term serving project compared to the rest of power generations to be able to meet the market demand.

Table I: Rwandan population growth rate predictions from 2000 up to 2050.
 (Source: www.Worldometers.info)

Year	Population	Yearly % Change	Yearly change	Migrants (net)	Median Age	Fertility Rate	Density (P/Km ²)	Urban Pop %	Urban Population	Country's Share of World Pop	World Population	Rwanda Global Rank
2020	12,952,218	2.64%	316,629	-9,000	20.0	4.10	525	17.6%	2,281,330	0.17%	7,794,798,739	76
2025	14,576,985	2.39%	324,953	-9,000	20.9	4.10	591	18.2%	2,659,944	0.18%	8,184,437,460	76
2030	16,234,387	2.18%	331,480	-9,000	22.1	4.10	658	19.4%	3,143,843	0.19%	8,548,487,400	76
2035	17,921,521	2.00%	337,427	-9,000	23.2	4.10	726	21.0%	3,768,985	0.20%	8,887,524,213	75
2040	19,633,864	1.84%	342,469	-9,000	24.4	4.10	796	23.2%	4,562,582	0.21%	9,198,847,240	76
2045	21,357,199	1.70%	344,667	-9,000	25.8	4.10	866	25.6%	5,477,407	0.23%	9,481,803,274	75
2050	23,048,005	1.54%	338,161		27.2	4.10	934	28.1%	6,483,462	0.24%	9,735,033,990	72

V. ENVIRONMENTAL PROTECTION.

According to the latest estimates by WHO, Household Air pollution(HAP) from cook stoves leads to over 4.3 million

deaths per year worldwide, more than HIV,Malaria and tuberculosis combined. Children represent a significant proportion of such deaths. Carbon monoxide and particulates from the fires are responsible for severe respiratory diseases, perinatal mortality, low weight births, cancer, eye illness

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10562>

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including blindness and cardiovascular diseases. The expanding practice of catering with agricultural remains in regions where wood is scant prompts much higher introduction to destructive smokes.

Biomass is the most used source of power in Rwanda. Research done by the United Nations statistics division (UNSD), biomass ranked for 87% and 86% of major used energy in the years 2014 and 2015, respectively. Similarly, ministry of infrastructure in the energy sector strategic plan

highlights biomass prevalence in the energy consumption as in figure below

ENERGY CONSUMPTION BY SUBSECTOR (2016)

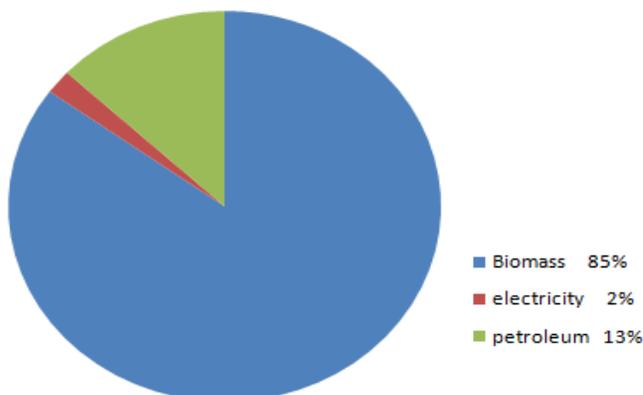


Figure3: contribution to total domestic energy consumption by subsector.

From the environmental standpoint, this extensive reliance on biomass for energy in the form of fuel-wood and charcoal - is no longer sustainable due to consumption being higher than production. Inefficiencies in the production and consumption of biomass for energy worsen the problem.

As a nation that tries to quick financial development, Rwanda has set a wide and comprehensive national objective, known as Vision 2020. The idea was to bring all Rwandans into the country's development journey, integrating green growth and climate resilience strategies Below are few points highlighting how Rwanda is regarded as one of the leading green growth on the continent.

- i) Rwanda's mission to maintain a clean and healthy environment has been going since 2008 when it banned the use of non-biodegradable plastic bags and packaging materials. Report by UN Habitat in 2008 announced Rwanda's capital, Kigali as one of the African cleanest cities.
- ii) To achieve its goal of increasing forest cover to 30% of total land area by 2020, Rwanda has embarked on massive reforestation and tree-planting drive, and new measures like as forest management are being executed.
- iii) Rwanda's commitment to conserve the environment has also been seen through the protection and restoration of degraded ecosystems such as wetlands, lakes and natural forests.

- iv) As one of the most vulnerable nations to climate change, Rwanda is acutely aware of the challenges that lie ahead. Along these lines, to accomplish its vision of a low-carbon and atmosphere versatile economy by 2050, Rwanda has set up the Green Fund, a pivotal speculation support, the biggest of its sort in Africa.
- v) For a country to achieve sustainable development, environmental sustainability must be taken into consideration. This applies to policies, legislation and programmes alike. Over the past years, the government has taken measures to ensure national development is in harmony with the protection of the environment [4].
- vi) Rwanda, as a result of its topographical component and climatic profile is one of the sub-Sahara African nations inclined to debacles and particularly confined avalanches and floods.

Rwanda's ministry of disaster management and refugee affairs (MIDIMAR) reported that, within a period of ten months (Dec/2010-Sept 2011), disasters produced a complex web of impacts, which spans various sectors of the economy. During this equivalent period, Rwanda enlisted 43 misfortunes of lives and 73 individuals were harmed. Plus, 1854 houses were demolished, 29,899 Ha of yields were harmed and one hundred (100) school study halls were genuinely decimated. Therefore, the expense of the mediation exercises as far as calamity reaction and recuperation to help the casualties was

in excess of 515,520,000 Rwandan francs . Different parts of the country are affected by landslide and floods differently due to many diverse reasons such as geo-aspects, soil type and other triggering factors etc. Most influenced Districts are Rutsiro Bugesera, Nyamagabe , Gicumbi, Kamonyi, Ngororero, Musanze, Rutsiro, Rubavu,

Muhanga, Nyabihu and Burera and this is worsened by elevated level of weakness and Exposure. For other Districts, the level of vulnerability is not very high (figure5) . Clearly floods and avalanches are expanding because of various activating elements [13].

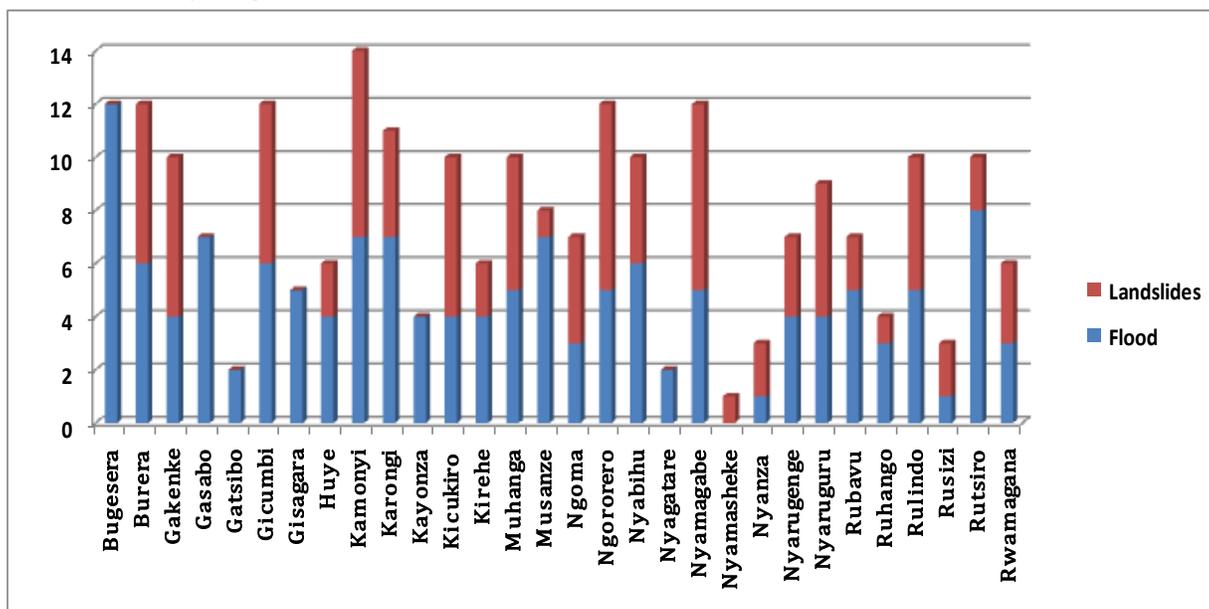


Figure4: Floods and landslides per District (in terms of affected sectors).

Other researchers have also made their contributions in elaborating the issues of landslides in Rwanda and highlighted some major landslide events and associated impacts and effects in different parts of the country (table1) within different periods of time to confirm the severity of landslide hazards and disasters in the study area [14].

few reasons including high precipitation and other distinctive causal elements. This has become an incessant destroying marvel which needs genuine and specific consideration regarding limit every single related effect that overpower the individuals living in inclined zones and subvert advancement activities [15].

Landslides for the most part happen from March to May for a

Table II: Latest main disasters caused by landslides in Rwanda.

Time	Place/Venue	Deaths and Injuries	Other Damages
April 2017	Muhanga/South	6 deaths and 27 injured	55 houses destroyed
May 2016	Gakenke/North	35 people killed and 26 injured	67 roads and 29 bridges
May 2016	Muhanga/South	8 people killed and 13 injured	5 roads damaged
May 2016	Rubavu/West	4 people killed and 5 injured	2 bridges destroyed
May 2016	Ngororero/West	13 deaths and 27 injuries	4 classrooms destroyed
April 2015	Ngororero/West	10 deaths and 13 injuries	24 houses destroyed
March 2013	Nyarugenge/Kigali	4 people killed and 3 injured	87 houses destroyed
April 2013	Gasabo/Kigali	3 people killed and 7 injured	56 houses destroyed
May 2013	Rulindo/North	12 people killed and 7 injured	79 houses destroyed
May 2013	Rutsiro/West	5 people killed and 2 injured	22 houses destroyed
May 2011	Nyabihu/West	14 people killed and 11 injured	300 houses destroyed

For Rwanda Country, it was affirmed that the precipitation parts of the nation differ to a great extent in space and in time (Figure 6) and this is brought about by various components including its geo-spatial restriction. Because of the ceaseless changes in precipitation designs, an expansion of genuine climate related risks including landslides that sway the nation

at various scale, dissipated across the country is enrolled. This affirms the method of reasoning for landslide weakness planning. Also, the nation has a twofold climate establishment clarified by the marvel of the sun that crosses the equator around March, and the southern summer around September every year.

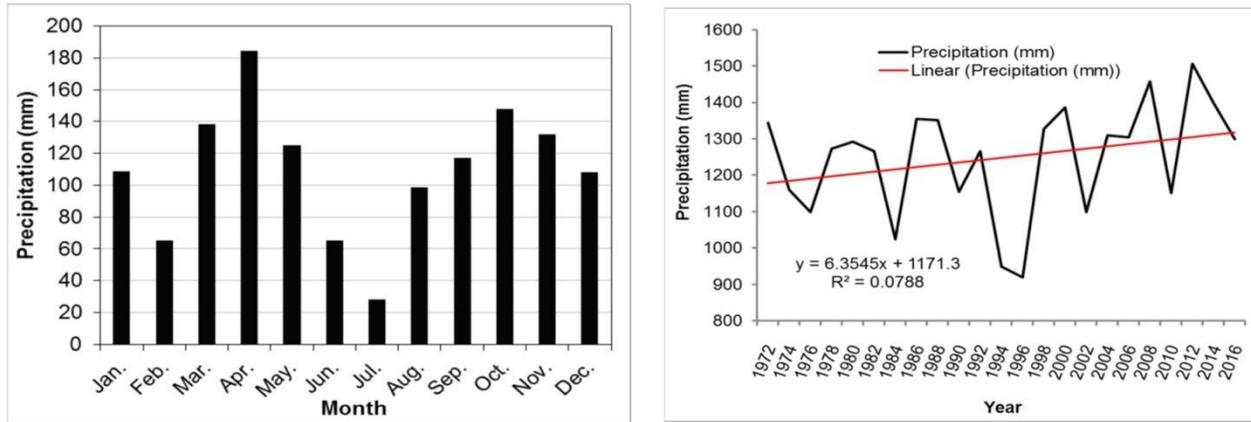


Figure 5: Monthly and yearly precipitation blueprint elements of Rwanda nation from 1972 to 2016.

The outlines in Figure 7 affirm the existence of landslide occasions in the examination zone, where they demolish various zones and harm a wide scope of properties including

houses, streets, bridges, infrastructure facilities, crops and environment and, in most cases, families are left homeless [14].



Figure 6: Regions influenced via landslides in the investigation region (Rwanda, January–September 2017).

It has been affirmed by past logical investigations that, for areas with uneven geographical nature, unsettling influences, for example, development of new streets, excavation activities and other distinctive man-made actions may cause Landslide exposure [13, 16], and, in this manner, specialists made a

decision about sensible to consider the good ways from fundamental streets as a landslide causal factor while carrying out susceptibility assessment studies.

The government of Rwanda (GoR) so far has done a

tremendous work in environmental preservation and protection through its long and short term set policies for instance in raising public awareness about reforestation, planting trees all over the country, banning the use of non-biodegradable plastic bags and packaging materials leads to the reduction of air pollution. In terms of rapid population growth rate the GoR emphasizes its citizens about family planning to produce whom they can afford to raise without being a burden to the government. Biomass usage is still at a high rate due to lack of enough and sustainable generated electric power, this is where this research comes in to highlight the inconveniences and with suggestions [17].

VI. RESULTS

Rwanda is a land locked country, its terrain is rugged with steep hills and deep valleys, rising in the north to the highest peak, Karisimbi (4,519 meters), which lies in a range of volcanoes. The country experiences shortage of water, electricity and apparently faces numerous disasters like droughts, floods, landslides, climate changes and as well rapid population growth rate, due to its geographical nature.

The GoR has introduced in place institutional framework to overcome the above mentioned challenges like Energy Sector Strategic Plan (ESSP) for 2018/19-2023/24 presents the current status of, and plans for, the energy sector, covering its three subsectors: electricity, biomass and petroleum, this is being monitored by the ministry of infrastructure under five years national policy priorities of Economic development and poverty reduction strategy (EPRS I) in line with long term national vision 2020 [18].

The government was expecting to achieve 100% access electricity by 2020, 100% access to much more cook stoves than currently used. Though a lot of work has been done in implementing national strategic plans in as far as hydropower development, environmental protection and accessible electricity are concerned but still there is a gap to fill in meeting the standard requirements of Rwandans, for instance in the capital city Kigali affordability of electricity is still an issue, landslides during rainy seasons leading to human destruction and displacement of people, charcoal is the most preferred fuel due to its long life storage and low cost transportation yet it is one of the main contributors to air pollution that leads to climate change which is currently a global issue, if these issues are still existing in the capital city simply shows how rural areas are experiencing more of it where there are places that don't have access to electricity at all and so on, this research highlights status of hydropower development, environmental protection and affordability of electricity and gives suggestions to support the existing ones [19].

VII. SUGGESTED MEASURES ON SUSTAINING HYDROPOWER, ENVIRONMENTAL PROTECTION AND AFFORDABLE ELECTRICITY NATIONAL WIDE.

To overcome the shortage of electricity, preserving the environment and having affordable electricity in Rwanda, proper measures and techniques need to be taken to guarantee sustainable development, in this article we suggest that due to the abundance of heavy rainfall a new technology of constructing dams in every areas of the country where there is a high precipitation to collect all water that is regarded as a disaster to the country and later be used to produce power as hydroelectricity since Rwanda is favored by its geographical nature (hilly area). By adopting this technology even preserving the environment due to the available collected water by dams can also be used for irrigation, fishing and many other purposes.

This article also suggests to establishing strong research institutions where all developmental projects are being developed and produce home grown quality engineers that are ready to face the challenges exist in the country even beyond, rather than relying on the solutions from abroad. For instance, if there is a university specialized in hydropower engineering with qualified professors under the support of the government and responsible of the researches and projects planning and their implementation, with this strategy there is a guarantee solution to the existing issues in this field of hydropower engineering.

VIII. CONCLUSION AND RECOMMENDATION

Sustainable social and economic development of Rwanda to be attained, enough and accessible electricity has to be available through the entire country, as shown in its electrification targets of universal access to electricity for all households by 2023/24 [10, 20, 21]. This article suggests the solution from the development of hydropower system, the combination of topology and hydrology make Rwanda an excellent place for hydropower generation. More emphasis is highly required by the government in encouraging local entrepreneurs to engage in this business of hydropower system by offering incentives such as lowering tax to the raw materials as a measure to attract more and build a competitive

environment amongst.

This research also proposes the GoR to attract more International investors with a condition to train the local citizens and learn from their experience targeting to be having skilled and experienced local people in near future.

Research institutions in Rwanda are still at the lowest level, the government of Rwanda through the ministry of education to promote strong research technology in the universities. Sustainable development goes with strong research institutions, learning from developed countries like china, most of china's big hydropower projects are done by universities. This is a solution not only in the development of hydropower sector but also boosting living standards of academicians or researchers at high level as well.

Rwanda experiences heavy rains that cause floods twice in a year with high annual precipitation. This article suggests the Construction of dams in all parts of the country to collect water to generate off /or on grid connected power, this is

going to unravel rural electrification deficit and also it's an environmental protective measure from flooding.

Traditional Biomass fuel is largely used national wide which is a challenge to the environmental protection, conversion to modern biomass would minimize the impact of the cause but with available and accessible electricity especially hydropower, it is the safest strategy to protect the environment and ultimately fastest sustainable development.

Rwandan rapid population growth rate is increasingly leading to environmental degradation and demands much electricity; our suggestion to the government is strictly enforce law to oblige a fixed number of children per family with serious penalties to those disregarding the law.

We suggest the government to subsidizing electricity consumption for the citizens hence easily accessing the available electricity in the country and able to afford according to their financial ability.

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The Factors That Influence Knowledge Sharing Among Administrative Employees: Evidence of Taibah University in Saudi Arabia

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DOI: 10.29322/IJSRP.10.09.2020.p10563

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10563>

Abstract- The study aims to investigate the significant effects of individual factors on knowledge sharing among individuals. Administrative employees are regarded as a key role to achieve the effective performance of the organization via sharing their knowledge with others to perform working tasks in an efficient way. In spite of various studies on this topic have been conducted, few researches have been done on knowledge sharing and individual factors in developing countries such as Saudi Arabia. The hypotheses are formulated based on insights drawn by Social Exchange Theory (SET) and Conservation of Resources Theory (COR). Simple random sampling technique was used with sample size 364 administrative employees at Taibah University. Data is analyzed quantitatively using a structural equation modelling (SEM) technique in Smart-PLS. Findings contributes to Saudi universities by combined individual factors (e.g. abusive supervision, trust, learning orientation, co-worker support) under one framework to affect knowledge sharing. This study helps to extend literature of knowledge management area.

Index Terms- knowledge sharing, abusive supervision, administrative employees, Social Exchange Theory (SET), Conservation of Resources Theory (COR).

I. INTRODUCTION

Knowledge sharing is currently recognized to be an essential asset of capital in organization like funds, people and machine which complements the activities of the business (Abdullah, 2017). Knowledge sharing is regarded as a core process of knowledge management which represents a corner-stone of modern organizations (Riege, 2005). Hwa and Lee (2018) explained that it is not easy to imitate and replicate individual knowledge because it is intangible which is more necessary than tangible knowledge. knowledge sharing defined as the willing to exchange personal knowledge like experiences, skills, thoughts, events or accommodating of whatever (Bock, Zmud, Kim, & Lee, 2005).

Scholars and practitioners have explored that though technological advances can gain knowledge, humans prefer to get the required information from other people directly due to individuals are the creators of knowledge activities (Allali, 2016; S. Choi, Kang, & Lee, 2008). Mahmoud et al.(2014) assert that if technology is only used as knowledge store without the role of individual sharing knowledge, it will be inactive method to knowledge management specifically aspect of knowledge sharing.

The context of this study is conducted in higher educational institution in Saudi Arabia, which recognized to be one of richest country all over the globe because it is oil-rich country and it is the central of Islam (Hayat & Tahir, 2019). In spite of these advantages, Saudi Arabia is categorized as developing country. Literature revealed that a lot of nations have experienced considerable changes across knowledge investment. It is clear there are differences in the economic development between developed and developing nations that their capabilities differ in which developed countries is more interesting to capture, disseminate, share and implement knowledge. Due to the economies around the world are now becoming more knowledge-based, knowledge has now transformed into one of the assets through which an organization can accomplish a competitive edge (Amirat & Zaidi, 2019; Bennet & Bennet, 2008). Hence, knowledge management is seen to be the strength for a country's development (Mahmoud et al., 2014).

Recently, Saudi government established Saudi vision 2030 that targets to be knowledge-based economy by countless plans such as fostering knowledge sharing in order to achieve the dream of becoming developed nation by the year 2030 (Bajhan, 2016). Therefore, developing humans is a responsibility which be achieved by some institutions in Saudi Arabia such as public schools, universities and

public or private sector institutions. Hence, universities sound to be the most important institution that could decrease the gap between current levels of knowledge and skills and the future level that is required in achieving Vision 2030. This vision emphasizes that Saudi universities must reduce the costs and expenditure, so effective knowledge sharing among individuals will contribute to reduce the costs of training employees and the time to get individuals knowledgeable.

In Middle East countries, there is a challenge that leaders block their employees to say or share their ideas even if it can improve performance due to they want to keep things as they are (Al-Raisi, Amin, & Tahir, 2011; Shmailan, 2016). Thus, leaders show as a stricter and sometimes more threatening leadership style (Hodigere & Bilimoria, 2015), which is considered as abusive supervision that may affect knowledge sharing among employees. As a result, employees may be unwilling to share ideas or experiences when this factor is applied. Also, it was clear there were gaps regarding individual knowledge sharing, specifically that few researches have been conducted in the Saudi context to explore the relationship between abusive supervision and individual knowledge sharing.

It is revealed from literatures that most researches of individual knowledge sharing focused on context of organizations such as public and private organizations, manufacturing businesses, healthcare industries, multinational companies and academic institutions, which the data were collected always from their respondents such as managers, supervisors, managerial employees, patients or social network users. However, literature review of knowledge sharing in context of universities investigated students and academic staff like lectures, even though the important role of administrative employees which has been ignored in previous studies particularly at Saudi universities (e.g. Alanazi & Alharbi, 2015; Alsuraihi, Yaghi, & Nassuora, 2016; Chen, Fan, & Tsai, 2014; Eid & Nuhu, 2009; Ghabban, Selamat, & Ibrahim, 2018; Jamal Alomari, 2017). To fill this gap, current study will focus on the population of administrative employees at Taibah University as a case study.

This study is an attempt to find out the most influencing individual factors in knowledge sharing in a university context. The objective of the study is to investigate the impact of abusive supervision, interpersonal trust, learning orientation and co-worker support on individual knowledge sharing.

II. REVIEW OF LITERATURE AND HYPOTHESES

Introduction

This chapter focuses on the literature that are related to the current study. The concepts and context that will be taken into consideration in this chapter include knowledge, knowledge management, and knowledge sharing with its types which are: tacit and explicit knowledge, then followed with the importance of knowledge sharing as a dependent variable. The second part provides the concept of independent variables, explaining the relationships and effects of individual factors on knowledge sharing and other previous studies that are related to this study, ending with research framework and summary of the chapter.

Knowledge

Regarding to Sohail and Hwa (2009; 2018), knowledge is not exactly data or information but relate to them broadly. Data refers to the group of separated objective facts like values or numbers or symbols, and information refers to a message or facts about person, situation or events, which either document or visible communication or auditable. However, knowledge refers to the power store of the modern generation of an economy where it is the crucial asset as knowledge-based economy. As well as, Karamipour et. al. (2015) said knowledge is considered as a mixed combination of shaped know-how, beliefs, contextual information, and vision of expert that leads to a framework for assessing and combining a new expertise and information. The human heads are embodied with diverse knowledge, while a considerable volume of knowledge is stored in businesses' artifacts like documents or repositories.

There are two categories of knowledge according to Girard (2015) incorporated into tacit and explicit knowledge. Tacit knowledge is comprised of judgments, intuitions, and feelings that will make it very difficult to elaborate and constitute, thus, it is complex to acquire individual knowledge. Therefore, it is probably personal and individual-based expertise. On the contrary, the second category explicit knowledge includes expressions of words and figures that can be systematically and officially shared and documented by data, specifications, manuals, videos tapes or another kind of documents.

Knowledge Management

The concept of knowledge management has emerged from more than 30 years that is considered as the main ingredient of an organization's success according to academic theory by Suthagar Nair (2017). In general, Webster et al. (2015) pointed out knowledge management as the process of implementing a systemic method to capturing, structuring, managing and disseminating of knowledge. These process of acquiring, organizing, sustaining, applying, sharing and renewing knowledge both tacit and explicit are to enhance organizational performance and to create value (Takeuchi, 1996). For instance, businesses are not just directing their existing knowledge, but also making initiatives in the creation and gaining of new knowledge. There are several activities of knowledge management such as creating, sharing and transferring the knowledge. These essential activities in organizations play a core role that contributes to establishing the sustainability and competitive advantage at a lower cost. It is always known that knowledge management activities activate innovation. Avdimiotis et al. (2012) told the key factors affecting the processes of innovation and competitiveness are knowledge sharing and transfer. Sharing knowledge among staffs is a necessary component in the knowledge management operations. There are several activities of knowledge management such as creating, sharing and transferring the knowledge. These essential activities in organizations play a core role that contributes to establishing the sustainability and competitive advantage at a lower cost. It is always known that knowledge management activities activate innovation. Avdimiotis et al. (2012) told the key factors affecting the processes of innovation and competitiveness are knowledge sharing and transfer. Sharing knowledge among staffs is a necessary component in the knowledge management operations.

Knowledge Sharing

The accurate definition of knowledge sharing is a combination of processes and activities that enhances employees to work together in which to empower the knowledge giver and taker. This enables learning oriented activities to support individuals' abilities to achieve individual and organizational missions (Hoq & Akter, 2012). The concept of knowledge management has gained extensive attention in management studies. There are many endeavors to provide empirically and theoretically explanations with guideline towards the development of knowledge management in this era. Indeed, individuals are commonly willing to acquire and utilize a specific type of information that is beneficial for functioning their working duties (Quinn, Anderson, & Finkelstein, 2005). This type of knowledge is not used when it is engaged with peers, but rather grown by aspects like comments, extension, and adjustments for the reciprocal communications of the individuals engaged. Thus, this knowledge is possessed by senders and recipients.

The worth of an organization is constituted of individual knowledge (Al-Raisi et al., 2011). At the individual level, Lin (2007) explained that knowledge sharing is to treat colleagues to help one get something done better, more quickly or more smoothly. Also in this level, knowledge is shared among employees in order to assist each other to be expert in the organization as they acquire new experiences, techniques and alternatives to getting their working tasks done efficiently and effectively. Nevertheless, knowledge sharing has been known to the organization as a beneficial power for improvement and high competitive advantage to the organization. However, this could jeopardize individuals costly as a result of spending time and more efforts in order to owning the knowledge. So it is not rational to decide to share knowledge with those who do not develop or work in this knowledge (Cabrera & Cabrera, 2002). Otherwise, individuals share knowledge when there are benefits in return as reciprocity relied on social exchange theory (Blau, 1964). Knowledge sharing is an essential source in most organizations that lead to long-term sustainability and therefore contribute to the success of organizations. Sharing knowledge does not only keep information, but it needs to be distributed and expanded through sharing processes. So, the act of exchanging knowledge among people in the same organization adds value to organizational activities (Wang & Noe, 2010). In conclusion, knowledge sharing can be considered as an important element for mutual improvement to employees (Eid & Nuhu, 2011).

Hypotheses

Abusive Supervision and Knowledge Sharing

Abusive supervision is referred to as "subordinates' perceptions of the extent to which their supervisors engage in the sustained display of hostile verbal and nonverbal behaviors, excluding physical contact" (Tepper, 2000). The study definition of abusive supervision is the threatened treatment from managers to their subordinates at workplace as a lack of social support from managers to his/her subordinates. Examples of this treatments are intimidating subordinates, using aggressive eye contact, shouting in them, preventing required information, criticizing them publicly and preventing them from promotion. The COR theory by Hobfoll (1989), explains that people perceive psychological stress when individual faces the real net of resources loss or when he/she has been threatened by losing his/her resources or when one got the failure of resource after he/she invested his/her resources. Abusive supervisors may be a critical source, which actively creates stressful demands and threatening circumstances (Aryee, Sun, Chen, & Debrah, 2008; Tepper, 2000). Under abusive supervision, employees should spend substantial energy with huge effort to deal with the interpersonal stressor rather than investing on their core job tasks or engaging in discretionary behavior such as knowledge sharing behavior (Aryee et al., 2008; Lee, Kim, & Yun, 2018; Tepper, 2000).

A reciprocity as a piece of the basic principles of social exchange theory by Blau, Cropanzano and Mitchell (1964; 2005), refers to the idea in the expression about positive reciprocity between two parties. However, it can be negative when one party got negative treatment that will be repaid with a negative return in future. Therefore, subordinates might repay abusive treatment by diminishing

their performance and reducing showing their resources such as knowledge sharing (Harris, Kacmar, & Zivnuska, 2007). Simon et. al. (2015) explored in their results that though most researches of leadership have concentrated on efficient managers' behaviors, their treatment always with their subordinates is not in a fair manner. This creates abusive supervision which disables sharing experiences and knowledge. Tang et. al. (2015) highlighted the role of ethical leadership on knowledge management employees, and how it can motivate employees to share knowledge but if it was unethical leadership will cause hidden knowledge by sharers. The results from 150 students at a university in Hong Kong displayed that ethical leadership positively impacts knowledge sharing, also these relationships were relatively mediated by employee psychological engagement. Interestingly, the study by Kim et. al. (2018) was drawn based on social exchange theory (SET) and the conservation of resources (COR) theory. The aim was to examine the negative consequence of abusive supervision on knowledge sharing, as well the moderating role of organizational tenure in this relationship. After distributed questionnaire to 150 employees and their direct supervisors, there was a negative relationship between abusive supervision and knowledge sharing amongst employees with the aforementioned relationship was reinforced for employees who have longer organizational tenure. By the above theoretical and empirical discussion, this study proposes the following hypothesis:

H1: Abusive supervision has a negative significant effect on knowledge sharing among administrative employees at Taibah University.

Interpersonal Trust and Knowledge Sharing

Mayer, et. al (1995) recognized interpersonal trust as "the willingness of a party to be vulnerable to the actions of another party depend on the expectation that the other will perform a particular action important to the trustor irrespective of the ability to monitor or control that other party." Trust relates to the expectation of honest and cooperative behavior in others' future actions that will lead to being exposed to other trustful people (Fukuyama, 1995). For instance, when one employee tells another that we together have children in same ages, and my child has a really complicated issue, so I need your opinion. Clearly, this employee is comfortable sufficiently to be vulnerable to another one that he/she shared personal matters by showing a high level of trust. Davenport et al. (1998) results signalized that without trust, the efficiency of knowledge initiatives will fail, irrespective of how thoroughly they are supported by technology and rhetoric. In this study, interpersonal trust meant as the expectations of honest and cooperative behaviors between individuals which they care about each other and interest in his/her well-being. In short, how extent he/she trusts the knowledge of their colleagues and how employees be open to others depending on good knowing of their actions in future.

Social Exchange Theory is one of the models that explain knowledge sharing behaviour (Blau, 1964). This scientist noticed that (SET) is interacted with people behaviour, outcomes, benefits, environment and interpersonal network. This theory argues that individuals may build their knowledge sharing behaviour depending on the future expectations that meant individuals will not share when they perceive activities as mere costs, but intend to share when positive returns are expected. As well, this theory assumed that the encouragement of voluntary actions of individuals is acquired by the returns they receive from others. Thus, trust emanates from the social exchange theory. One aim of this paper is to examine the influence of individual factors, i.e., interpersonal trust on knowledge sharing based on the social exchange theory. Al-Alawi et. al. (2007) were motivated in their study to explore the role of culture on knowledge sharing when they were searching in many factors could break the obstacles about preventing sharers of knowledge with others in businesses. The result was that interpersonal trust associated positively with knowledge sharing in businesses. Hence, the study proved interpersonal trust is prerequisite for the success of knowledge sharing. Also, Fauzi et al. (2018) have findings which individuals will share their knowledge when trust is existed among them that the knowledge will be shared could yield the benefits for the organization and themselves in return. In Oil Palm Plantation company in Malaysia, Suthagar Nair (2017) conducted a qualitative study in depth interviews with management staff to explore the level of knowledge sharing and knowledge transfer. It was revealed that trust related positively to knowledge management activities as enablers. According to Nissen et. al. (2014), interpersonal cooperation obtains an important role of knowledge sharing. This is more likely to form a relationship based on trust when an individual is willing to provide the necessary knowledge. In short, human beings remarkably share their knowledge if they are more trusting which means interpersonal trust influences the extent of knowledge sharing. Therefore, existing study based on the above literature reviews tests the following hypothesis:

H2. Interpersonal trust has a positive significant effect on knowledge sharing among administrative employees in Taibah University.

Learning Orientation and Knowledge Sharing

Vandewalle (1997) defined learning orientation as the desire of individuals to develop their abilities across acquiring new skills, mastering new situations, and improving their competence from experiences. Sinkula et. al. (1997) recognized learning orientation as the ability of individuals to create, disseminate, and utilize knowledge. In current study, learning orientation is the desire of individuals to develop their abilities by learning new skills and mastering new situations. This leads to overcome difficult situations at workplace and to impress others with their achievements, and to avoid negative evaluations. Archer (1988) invoked that learning-oriented employees might participate more in knowledge sharing activities because of several reasons. The first reason is that learning-oriented employees are interested in the development of the skills and knowledge enhancement not only for themselves but also for their colleagues (Carol S. Dweek, 1986; Vandewalle, 1997). Knowledge sharing is considered as the prerequisite for learning. Therefore, this behaviour is needed for further personal development. Secondly, learning orientation is positively related to self-

efficacy, which in turn influences decisions about what behaviours should be undertaken and the mastery of the behaviour. If the employee developed his/her abilities and skills (self-efficacy about one's knowledge), he/she will be more likely to share with others, even though the process of knowledge sharing is difficult, risky, and time-consuming (Hsu, Chang, Ju, & Yen, 2007).

Depending on reciprocity principle of Social exchange theory, individual who seeks to acquire new skills and knowledge development could generates a reciprocal relationship with his/her coworkers by sharing their knowledge which offers them an efficient way in order to earn knowledge and valuable feedback in return (Giles Hirst, Daan Van Knippenberg, 2009; Vandewalle, 1997). Bock et al. (2005) stated that employees with high learning orientation are less competitive with their co-workers because they esteem inner development more than contrasting others. Besides, knowledge sharing offers them the chance to comprehend their insight level. In other words, when individuals share and disclose knowledge to other people, they can all the more likely comprehend and evaluate their dimension of knowledge, aptitude and expertise. This causes them to discover regions of enhancements. Thus, employees with high learning orientation are more likely to engage in sharing their knowledge with co-workers than those with low learning orientations (Lu, Lin, & Leung, 2012). Dongqin (2011) affirmed the important relations between learning orientation and knowledge management with joining them to export and financial performances of the export-oriented firms. Findings showed learning orientation have a positive effect on knowledge management capabilities and knowledge management positively influences export performance of firm and financial performance. As a result of the theoretical and empirical background, learning orientation is regarded as one of the most dominant factors enhancing knowledge sharing among employees. Referring to empirical studies and theoretical implications, current study hypothesizes the following:

H3: Learning orientation has a positive significant effect on knowledge sharing among administrative employees at Taibah University.

Co-worker Support and Knowledge Sharing

Hodson (2001) identified coworker support as the perceptions of employees that their coworkers provide the care and valuable treatments because they are willing to offer them assistance when it needed. Co-worker support is a crucial element to enhance knowledge sharing amongst people in order to create perfect cooperation across employees in an organization. Rationally, if the employees suffer to obtain their rights in an organization, the potential of hoarding their experiences increase and they were unwilling to share their knowledge (S. Kim & Yun, 2015). Contrastingly, the support from co-worker plays a critical way to change unsatisfying individual's behaviors. That if co-worker support increase, employees will reduce withholding knowledge sharing as a form of reciprocity according to social exchange theory. As well, employees are affected by co-worker support which reduces the internal stress on employees regardless the reduction of support from managers or organization because co-worker support will encourage the level of knowledge sharing (Chiaburu & Harrison, 2008). Co-worker support reflects a fundamental motivation for people in order to create perfect friendly cooperation among employees in work environment (Zhou & George, 2001). Social exchange theory is one of the most affected theory in organizational studies of institutions (Cropanzano & Mitchell, 2005). Regarding the basis of the norm of reciprocity (Blau, 1964; Eisenberger, Huntington, Hutchison, & Sowa, 1986), employees who receive favourable support from one party, are more likely to engage in effort and dedication to repay favourable treatment to that party (Gouldner, 1960). Hence, administrative employees at the workplace always prefer to develop and support social exchange relationships with other partners encompassing co-workers, organization and leaders.

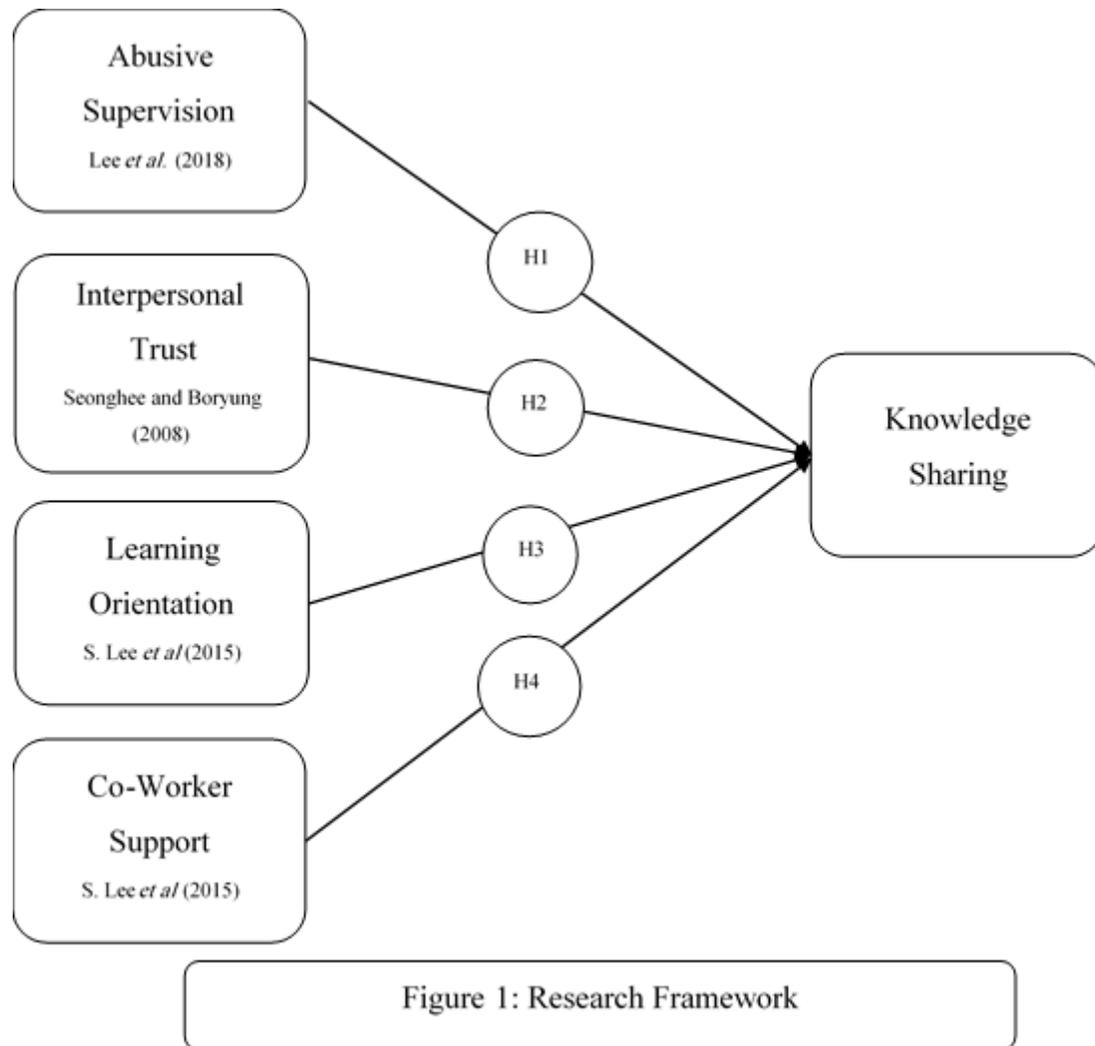
Soojin Lee et. al. (2015) tried to explore how individual knowledge sharing can be facilitated by individual characteristics and co-worker support. Their sample was employees of two Korean organizations which resulted that co-worker support play a positive role to encourage knowledge sharing. This interpreted that regardless of individual characteristics, high co-worker support pushes employees to raise the level of sharing their resources successfully. Yun Hwa & Lee (2018) categorized the co-worker support to two types which are person-focused co-worker support and task-focused co-worker support. Their study built two kinds of survey in which first one distributed to target employees and second one was distributed to co-worker who work in team. The results showed that person-focused co-worker support has a positive relationship with knowledge sharing. As a result of previous studies, co-worker support is one of the most dominant factors enhancing knowledge sharing among employees. Therefore, depending on the theoretical and empirical findings, support of co-worker have a significant impact on employee's knowledge sharing, which contribute to the following hypothesis:

H4: Co-worker support has a positive significant effect on knowledge sharing among administrative employees in Taibah University.

Research Framework

This research aimed to develop a research model that connects individual factors which are abusive supervision, interpersonal trust, learning orientation, co-worker support and knowledge sharing. The study deepens the understanding of the factors affecting employees' knowledge sharing by drawing on social exchange theory (SET) and conservation-of-resources theory (COR) as developing a model from other studies. Abusive supervision is adopted from Lee *et al.* (2018) by applying conservation of resources theory (COR), interpersonal trust is adopted from study by Seonghee and Boryung (2008). Other two variables are adopted from study by S. Lee et al. (2015) that proved there were a positive significant effects of co-worker support and learning orientation on

knowledge sharing. The finding of this research display that there is a positive significant influence of interpersonal trust, co-worker support and learning orientation on knowledge sharing among individuals, which supported by social exchange theory (SET), while there is a negative significant effect of abusive supervision on knowledge sharing drawn by conservation-of-resource (COR) theory and SET which are used as underlying theoretical frameworks to support the study. The current research framework is shown as following:



III. MATERIAL AND METHODS

The survey method used simple random sampling, which was employed in collecting data from a sample of 340 administrative employees selected from Taibah University in Saudi Arabia. The survey questionnaire elicited responses based on a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. Online questionnaire is adopted by this study as an instrument to collect data from the respondents to be distributed at Taibah University organization throw the period of 3 months from November 2019- February 2020. The survey instrument contains 40 questions or items which are adopted from literature as following. Knowledge sharing was measured within administrative employees using seven items from Srivastava, Bartol, & Locke (2006), abusive supervision was measured by Tepper (2000) using 15 items to measure employees' perceptions of abusive supervisory behaviours, interpersonal trust was measured using five items selected from Seonghee and Boryung (2008), learning orientation was measured using sex items adopted from Vandewalle (1997), and finally co-worker support was measured using seven items from Tsui et al. (1997).

IV. FINDINGS

In the course of achieving the objectives of this study, Hypothesis 1 was assessed by testing the direct effect of abusive supervision on knowledge sharing. After that, H2, H3, and H4 were measured as well by testing the direct path between interpersonal trust, learning orientation, and co-worker support on knowledge sharing. The results from the bootstrapping test by Smart-PLS show that 4 of 4 hypotheses were significant that abusive supervision has a negative influence on knowledge sharing among administrative employees at Taibah University. However, interpersonal trust, learning orientation and co-worker support have positive influences on knowledge sharing. Table 1 shows the finding of direct paths between the four independent variables and knowledge sharing.

Table 1: Evaluation of Research Hypothesis and Results of Direct Relationships

Path	Original Sample	T value	P value	Significant level	Results
Abusive Supervision -> KS	-0.059	1.389	0.083	*	supported
Interpersonal Trust -> KS	0.277	4.256	0.000	***	supported
Learning Orientation -> KS	0.173	3.439	0.000	***	supported
Co-worker Support -> KS	0.087	1.403	0.081	*	supported

Notice/ * P value < 0.10 ** P value < 0.05 *** P value < 0.01. KS= Knowledge Sharing

Table 1 shows the findings of the direct effects of abusive supervision, interpersonal trust, learning orientation and co-worker support on knowledge sharing. Of the four proposed hypotheses, four are found significantly correlated. Specifically, the findings show that abusive supervision is negatively significant and correlated with knowledge sharing ($\beta = -0.059$, $t = 1.398$, $p = 0.083$). Thus, the findings indicate that the H1 is supported. It means that when administrative staff are abused from their managers, they are not willing to share their knowledge. The findings further show H2 was found to be significant positively ($\beta = 0.277$, $p\text{-value} = 0.000$). Also, $t\text{-value} = 4.256$ which meant that this factor is most important factor affecting individual knowledge sharing. Based on the results of statistics (Table: 1), H3 was found to be significant positively ($\beta = 0.173$, $t\text{-value} = 3.439$, $p\text{-value} = 0.000$). This meant that administrative employees at Taibah University have a high desire to learn as oriented learning people which contributes to increase the level of knowledge sharing among employees. H4 was found to be significant positively ($\beta = 0.087$, $t\text{-value} = 1.403$, $p = 0.081 \leq 0.10$). This meant that there is high level of support from co-workers with each other at Taibah University. Thus, the findings indicate that the H1, H2, H3 and H4 are strongly supported.

V. DISCUSSION

The objective of the research was to examine the effect of the following factors, abusive supervision, interpersonal trust, learning orientation and co-worker support on knowledge sharing among administrative employees at Taibah University. The study examined the relationship and influence of the four individual factors on knowledge sharing. The findings suggest that interpersonal trust, learning orientation and co-worker support are ones of the core antecedents as enablers of knowledge sharing among individuals in the organization as highlighted by the structure model results in chapter 4, but abusive supervision is as disabler for knowledge sharing. These factors contribute to shape the actions of knowledge sharers that is as a stimulus of knowledge sharing positively or negatively. Firstly, most previous researches agreed with current study findings that abused employees by their managers are not willing to share their knowledge (Lee et al., 2018; Seckyoung Loretta Kim, Soojin Lee, 2016; Tang, Chen, & Tjosvold, 2015). For example, the study by Lee et al. (2018) resulted after distributed questionnaire to 150 employees and their direct supervisors, that there was a negative relationship between abusive supervision and knowledge sharing amongst employees. Contrastingly, little studies like Zhang et al. (2017) claimed that the role of abusive supervision enhances employees to involve in knowledge sharing activities. That means abusive supervision produces a negative state to individuals which when employees have aggressive treatment by managers, they show their competences by sharing their knowledge to get empathy from their managers. This makes them experience a negative mental state as psychological problems like the lack of resilience or pessimism, which have a positive impact on tacit knowledge sharing.

Another finding by this study that knowledge sharing is influenced positively by interpersonal trust. Previous researches supported this finding (Ding, Choi, & Aoyama, 2018; Fauzi et al., 2018; Sanjaghi, Technology, & Akhavan, 2013; Suthagar Nair, 2017). Employees are more desirable to share their experiences with individuals who have a greater level of interpersonal trust. However, few previous findings such as Yeo and Gold (2014) explored that knowledge sharing negatively affected by trust. Other few researchers like Ouakouak, Jolae and Seonghee Kim (2014; 2018; 2008) found that interpersonal trust has an insignificant relationship with knowledge sharing that these findings are different with this study results and above previous studies. Therefore, the study asserted interpersonal trust is the most important factor influencing individual knowledge sharing successfully.

According to the results, learning orientation also has a positive meaningful influence on individual knowledge sharing, which was aligned with previous studies (Dongqin Li & Li, 2011; Khalid & Ahmed, 2015; Lee et al., 2015; Swift, Balkin, & Matusik, 2010; Wu & Lin, 2013). Nevertheless, little studies included that knowledge sharing among employees is not affected significantly by learning orientation such as Choi *et al.* (2018).

Eventually, it is remarkable during the current research that co-worker support has a positive effect on knowledge sharing among administrative employees. Most previous researches are similar to this finding regarding the positive role of co-worker support to enhance knowledge sharing (Chae, Park, & Choi, 2018; Lee et al., 2015; Yun Hwa & Lee, 2018). For instance, the findings by Chae *et al.* (2018). This demonstrated that individuals with high co-worker support strengthen knowledge sharing behaviour.

The knowledge sharing is an activity that concerned with active collaboration among members inside an organization and these members must have a shared understanding. Therefore, this study found that four factors that are abusive supervision, interpersonal trust, learning orientation and co-worker support have positive and negative significant impacts on knowledge sharing among administrative employees.

VI. CONCLUSION

The purpose of this study is to examine individual knowledge sharing drawing by the use of SET and COR theories. A quantitative study was conducted among 340 administrative employees. The study used Partial least square analysis to test the hypotheses. The findings of first research question revealed medium to high level of knowledge sharing. Other findings appeared that individual variables have the significant influence on knowledge sharing among employees. Accordingly, interpersonal trust, learning orientation and co-worker support have the positive influence on knowledge sharing which assisted to increase the level of knowledge sharing among administrative employees at Taibah University. Besides these positive relationships, knowledge sharing among employees was negatively influenced by abusive supervision. According to the findings of the study analysis, interpersonal trust was the most influential factor affecting knowledge-sharing among administrative employees at Taibah University. Learning orientation was the second most significant factor affecting knowledge sharing.

Despite limitations, this study enriches our understandings of the key role of interpersonal trust, co-worker support and learning orientation as the triggers to individual knowledge sharing. Also, this research provides additional evidence of the usefulness of conservative-of-resource theory. Additional researches in this area may explain the complexity of knowledge sharing among individuals. As the role of knowledge becomes more significant, advances of knowledge sharing performance will contribute to the success of administrative employees to do their duties, and it leads to the advancement of academic theory. Lastly, the findings summarized that administrative employees should readily impart their knowledge to partners, and managers ought to focus on these four factors to raise the level of individual knowledge sharing.

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Artificial Intelligence based analysis to evaluate for RBC cells, Pus cells and Calcium Oxalate crystals in Urine sediment slide microscopy: A pilot study in North India

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DOI: 10.29322/IJSRP.10.09.2020.p10564

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10564>

Abstract- Introduction: Microscopy is the simplest and the most important step in the diagnosis of infections (urinary tract, kidney, prostate), sexual transmitted infections (STI), kidney or bladder stones, hemophilia, interstitial cystitis, bacteremia with sepsis, prostatitis and parasites. But the microscopy requires considerable experience and is bound to have human errors. Artificial intelligence (AI) based microscopy can be an answer to this problem. AI can be used even where expert microscopists are not available. Sevamob provides artificial intelligence enabled healthcare platform to organizations. It uses deep learning for image recognition, machine learning for triaging and computer vision for object counting. AI models of various medical conditions are first trained in the software from anonymized image data procured from various sources and then tested on the test set. To determine the accuracy of AI based point-of-care screening solution for urine sedimentation, following were used: Android Smartphone / tablet with Sevamob app, tripod and a simple microscope. The system was operated by a nurse or a technician with minimal training.

Methods: 100 ml urine samples from clinically suspected infections (urinary Tract, kidney, prostate), sexual transmitted infections (STI), kidney or bladder stones, hemophilia, interstitial cystitis, bacteremia with sepsis, prostatitis, parasites and dehydration were included in the study.

Results: Out of these 196 smears, 40 had RBCs, 90 had pus cells, 38 had calcium oxalate crystals and 18 smears were negative when examined by an expert Pathologist. These smears were also analyzed by the AI system. Overall accuracy of AI was 64.06% for RBCs, 89.81% for pus cells and 87.50% for calcium oxalate crystals. The sensitivity of AI based microscopy was 58.54% for RBCs, 82.47% for pus cells and 65.31% for calcium oxalate crystals and the specificity was 94.44% for the supported conditions.

Conclusion: This shows that Sevamob's AI based microscopy system can be very useful to find RBCs, pus cells and calcium oxalate crystals in the urine samples. These indicate the likelihood of one or more of the following medical conditions - infections (urinary tract, kidney, prostate), sexual transmitted infections (STI), kidney or bladder stones, hemophilia, vigorous exercise, interstitial cystitis, bacteremia with sepsis, prostatitis, parasites or dehydration. The system has the potential to replace expert microscopists in the future. Further, the sensitivity and the specificity depends on the threshold used by the AI system.

Index Terms- RBC Cells , Pus Cells , Calcium Oxalate crystals, Artificial intelligence, Microscopy

To,
The Editor
Respected Sir,

I am submitting an original article manuscript entitled "Artificial Intelligence based analysis to evaluate for RBC cells , Pus cells and calcium Oxalate crystals in Urine sediment slide microscopy: A pilot study to know the efficacy of the software" for your consideration.

Sevamob provides artificial intelligence enabled healthcare platform to organizations. It consists of AI based triage and point-of-care screening, telehealth and popup clinics. We provide this platform to various B2B customers in India and the US.

Infections (urinary tract, kidney, prostate), sexual transmitted infections(STI), kidney or bladder stones, hemophilia, interstitial cystitis, bacteremia with sepsis, prostatitis, parasites and dehydration are common in some of these countries and due to the lack of expert microscopists, timely diagnosis is very difficult. To overcome this issue, we have developed an artificial intelligence-based system to diagnose these diseases in the sediment urine sample, simply with the help of technician or nurse and our app.

We therefore did the above-mentioned study and came out with some interesting findings which we would like to publish in your esteemed journal. These findings can be applied by the clinicians right away and may decrease the wrong diagnosis of the above-mentioned medical conditions in remote areas where expert microscopists are not available.

Thanking you,

Yours Sincerely
Dr. Ankit Agarwal
Chief Medical Officer
Sevamob Ventures Limited

I. INTRODUCTION

Microscopy is the first and the foremost step in the diagnosis of infections (urinary tract, kidney, prostate), sexual transmitted infections (STI), kidney or bladder stones, hemophilia, interstitial cystitis, bacteremia with sepsis, prostatitis and parasites. The urine discharged by healthy people is ought to be clear and sterile, however certain sediments in the urine can reflect the corresponding diseases. For example, from the appearance of a great quantity of WBCs in the urine we can speculate that the patient has urinary system inflammation. A large number of RBCs, calcium oxalate crystals (CAOXs), and hyaline casts (HYALs) shows that the patient has urinary tract calculi and so on [1],[33],[34]. Therefore, microscopic examination of micro-particles in human urine analysis is one of the most important external diagnostic projects in nephrology and urology departments. Compared with the urine dry chemical method, urine sediment microscopy can directly reflect the corresponding symptoms of patients using microscopic images, and plays an irreplaceable role in urine analysis [35],[36].[1]. Also, in remote areas, due to the lack of expert microscopist, timely diagnosis at initial level is not possible, which may lead to increased morbidity. Artificial intelligence (AI) based microscopy can be an answer to overcome this problem. AI can be used even in the remotest areas where expert microscopists are not available.[3] The use of artificial intelligence in medicine is currently of great interest.[2,4,5,6] The diagnostic and predictive analysis of medical photos, for instance, photographs of skin lesions, microscopic pathological images[9-11] and radiological images are one of the clinical practice fields where artificial intelligence is expected to have a major influence.[7-14].This potential usefulness is largely due to the advances in deep learning with artificial deep neural networks (NN),which consist of a stack of multiple layers of artificial neuronal links that loosely simulates the brain's neuronal connections, and methods specialized for analysis of images, such as the convolution neural network, a particular form of deep neural network that conceptually mimics the visual pathway [12,15,17]. Adoption of artificial intelligence tools in clinical practice requires careful, meticulous confirmation of their clinical performance and utility before the adoption.[16] Based on the urgent need for data standardization and interoperability in digital microbiology, we launched a cross-departmental prospective quality improvement project to incorporate artificial intelligence digital microbiology technology and outline the resource requirements for implementation. The solution presented here empowers microbiologists and pathologist to gain an appreciation of and enable the assessment of the appropriateness of the AI system for diagnosis. We have also shown that current AI systems can aid in the timely diagnosis of infections in resource constraint setting of developing countries like India. The use of artificial intelligence-based diagnosis and data regarding the same is scarce to the best of our knowledge.

Sevamob provides artificial intelligence enabled healthcare platform to organizations. It uses deep learning for image recognition, machine learning for triaging and computer vision for object counting. AI models of various medical conditions are first trained in the software from anonymized image data procured from various sources and then tested on the test set. The software can then be used to screen for these medical conditions in new samples. The system can work fully offline in the last mile, low resource settings. We therefore planned this study with the aim to evaluate AI for identification of the above mentioned medical conditions in urine samples.

II. METHODS

This study is a retrospective observational study and this study was done at three Sevamob pop-up clinics at Lucknow, Jharkhand and Rajasthan in India. Urine samples from 196 clinically suspected patients of infections (urinary tract, kidney, prostate), sexual transmitted infections (STI), kidney or bladder stones, hemophilia, interstitial cystitis, bacteremia with sepsis, prostatitis and parasites were taken to do this study. To determine the accuracy of AI based point-of-care screening solution for sediment urine sample, following were used: Android Smartphone/tablet with Sevamob app, tripod and a simple microscope. The system was operated by a nurse or a technician with minimal training. The user first prepared sediment urine samples slides of the above mentioned suspected medical conditions.

To perform the sediment urine microscopy, urine was collected from catching the mid-stream urine in the correct container (at least 50-100 ml, opening of at least 5 cm diameter) in appropriate patient preparation and manner. Once the sample of urine was properly collected, 10 to 15 ml of the well-mixed urine was poured in to a test tube and placed in a centrifuge (the test tube should always be balanced with a second test tube filled with water/another urine sample) of equal volume centrifuge the sample at low speeds of between 2,000 to 3,000 rounds per minute for about 3 to 5 minutes. The supernate was decanted (to retain about 0.2- 0.5 ml inside the tube), shaken and the supernate was retained in the test tube. A drop of the re-suspended sediment was placed on a microscopic slide by using a pipette and a cover slip was placed over the drop. It was ensured that the specimen filled the area under the coverslip without

overflowing and that there were no bubbles in the specimen under the coverslip. The smear was analyzed both by an expert microscopist and by the AI based system.

For the AI analysis, the user used the smartphone app to analyze camera feed of microscopic images of various sections of the slide. The app confirmed if the sample had RBCs, pus cells or calcium oxalate crystals and even marked it on a live camera feed. The detection of RBCs, pus cells and calcium oxalate crystals was done onsite by Sevamob AI which worked fully offline on mobile and could be synced with the cloud once the network was available. The AI was previously trained to detect RBCs, pus cells and calcium oxalate crystals and it showed the percentage probability of the detected concepts. A threshold of 60% was used to consider a sample positive for a concept. The AI results were compared with those of an expert microscopist. The evaluation of true positive, true negative, false positive and false negative was done based on the result of the comparison between the expert and the AI result.

Inclusion criteria for sediment urine sample slide examination: We included 196 patients who came for routine Urine evaluation in microbiology at our site, Consent was taken from the patient/ patient attendant when they came for routine Urine in microbiology lab. Exclusion criteria: All the patients on chemotherapy and radiotherapy and women who were having periods at that time.

III. RESULTS

We analyzed 196 sediment urine sample slides as shown in table 1. Out of these 196 smears, 40 were positive for RBC, 90 were positive for pus cells, 38 smears were positive for calcium oxalate crystals and 18 smears were negative when examined by an expert pathologist. These smears were also analyzed by AI system. The overall accuracy of AI was 64.06% for RBCs, 89.81% for pus cells and 87.50% for calcium oxalate crystals. The sensitivity of AI based microscopy was 58.54% for RBCs, 82.47% for pus cells and 65.31% for calcium oxalate crystals and the specificity was 94.44% for all the supported concepts. Based on these findings, sensitivity, specificity, positive predictive value, negative predictive value and likelihood ratio of AI based microscopy were calculated. These are depicted in table 1, 2, 3, 4 & 5.

Table 1. Results of the AI system

Testing Input				Testing output (App.)			
RBC	PUS CELL	Cal. OXALATE	Normal	RBC		PUS CELL	
				Correct	Incorrect	Correct	Incorrect
46	90	38	18	22	24	80	10

Table 2. Accuracy of each concept in the AI analysis

Accuracy RBC + Normal	60.93%
Accuracy Pus Cells + Normal	89.81%
Accuracy Calcium Oxalate crystals + Normal	91.07%

Table 3. Results of an expert microscopist

Sample	Test	Positive	Negative
Urine	RBC	46	18
	Pus cell	90	18
	Calcium Oxalate Crystals	38	18

Table 4: Results of AI based system as compared to the results of an expert microscopist

Module	True Positive	False Negative	True Negative	False Positive
RBC	24	22	17	1
PUS CELL	80	10	17	1
Calcium Oxalate Crystals	32	6	17	1

Table 5. Diagnostic parameters of Artificial Intelligence (AI) based system

Diagnostic parameters	RBC	Pus Cell	Calcium Oxalate Crystals
Sensitivity	58.54%	82.47%	65.31%
Specificity	94.44%	94.44%	94.44%
Positive Likelihood Ratio	10.54	14.85	11.76
Negative Likelihood Ratio	0.44	0.19	0.37
Disease prevalence			
Positive Predictive Value	96%	98.77%	96.97%
Negative Predictive Value	43.59%	62.96%	73.91%
Accuracy	64.06%	89.81%	87.50%

Image 1 (UR625) shows the probability of RBC Cells in an image analyzed by AI. % probability of RBCs ranged from 73% to 99% in a microscopic field.

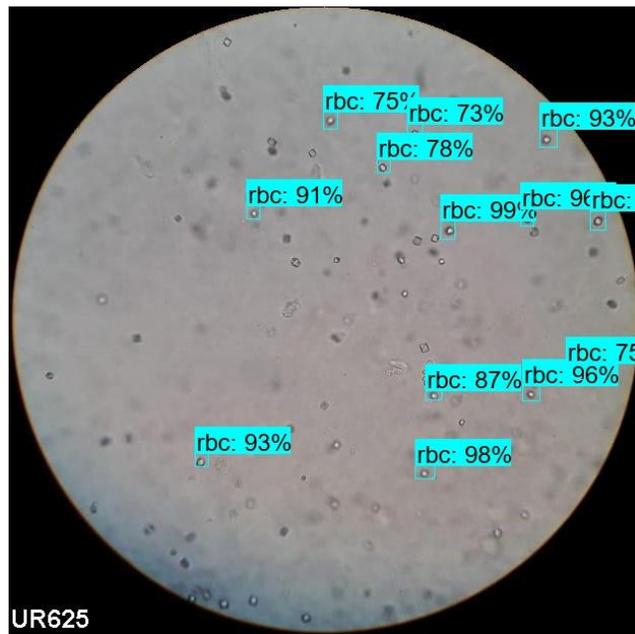


Image 2(UR573) shows the probability of Pus Cells in an image analyzed by AI. % probability of Pus Cells ranged from 55 % to 99% in a microscopic field

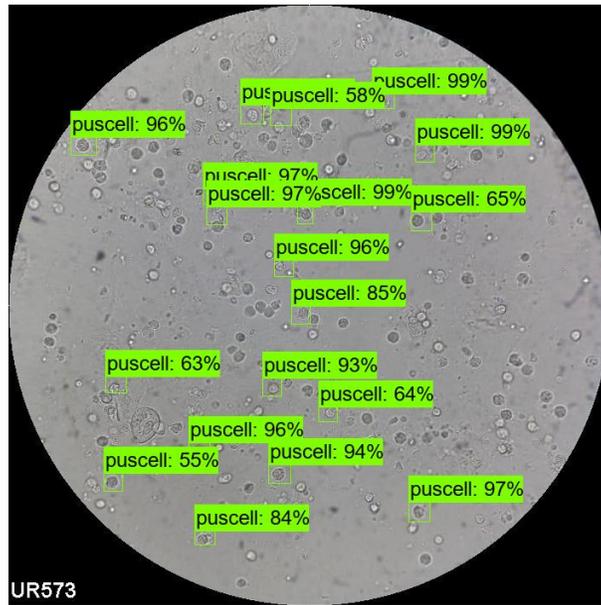


Image 3 (UR625) shows th probability of Calcium Oxalate crystals in an image analyzed by AI. % probability ranged from 71% to 99% in a microscopic field.

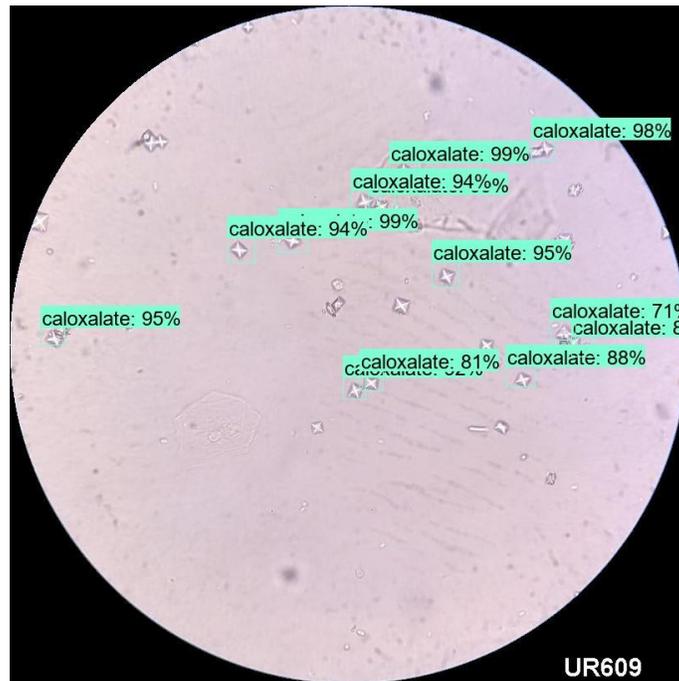
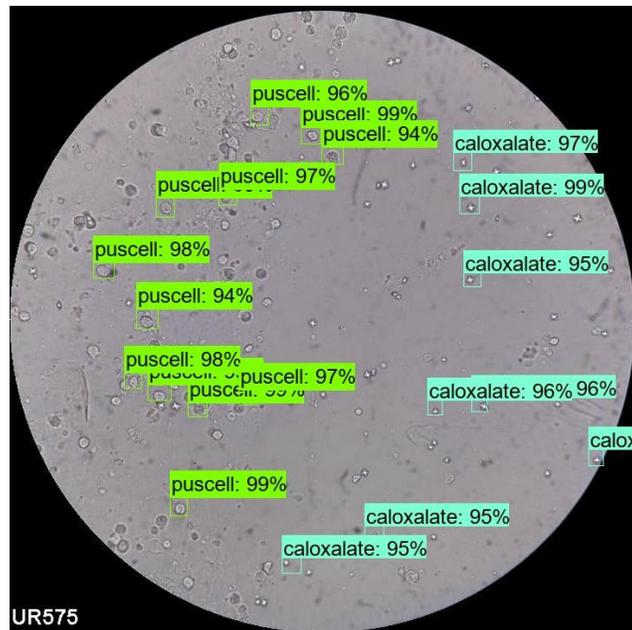


Image 4 (UR575) shows the probability of Pus Cells and Calcium Oxalate in an image analyzed by AI.



IV. DISCUSSION

In the present pilot study, we have analyzed 196 sediment urine samples for presence of RBC cells, pus cells and calcium oxalate crystals and correlated with AI system. The sensitivity and specificity were found to be good. This shows that this particular AI system may be very useful for detection of presence of these concepts and can replace the requirement of an expert microscopist in future. The sensitivity and the specificity of AI also depends on the threshold set for the AI system used. In our study this threshold was set at 60% and this was decided after training and internal lab testing of samples at different thresholds of 5% intervals (50%-80%). We found optimal sensitivity and specificity at 60% threshold only. It should be noted that this idea is called self-adjusting neural networks that adjust themselves to a boundary to that the input data and their outcome must convert. To our understanding the meaning of a self-learning classification system adjusts the "rules" to a given final outcome. At higher threshold, there were too many false negatives. At lower threshold, there were too many false positives. It finds appropriate that the implementation of an automated diagnosis or pre-screening system consists of several modules that should work independently from each other. This approach of a control and an evaluation of the objective image quality is necessary so that one can easily evaluate the results of AI and microscopy. The system has used various enhancement techniques. The shape features extraction technique had been implemented to extract various shape features and finally for classification, the support vector machine was used as a pattern recognition tool to classify the objects as RBC cells, pus cells or calcium oxalate crystals.

As per the best of our knowledge, such AI based pilot study has never been done before in India or elsewhere in the world. Few automated microscopy systems have been used in the past, but they were not based on artificial intelligence. The traditional automatic recognition methods, as the main methods of urine sediment images recognition, mainly relied on artificial feature extraction and the classification. Sun et al. [18] proposed a new detector named aggregate channel features plus (ACF) detector which is based on aggregate channel features (ACF) for urine sediment detection. Sun et al. [19] adopted ACF, which are variant and discriminative, combining improved soft-cascade and a boost classifier for RBCs detection in urine sediment micrograph. Zheng et al. [37] successfully used AI for histopathology examination to segment colon gland, breast tissue, as well as nuclei as reported by different authors in their study [25-32].

The limitation of our study is the small sample size. A larger sample size study is further required to validate our system.

V. CONCLUSION

In this pilot study, automated AI based identification of RBC cells, pus cells and calcium oxalate crystals has been done. This AI based software method reduces fatigue and screening time by providing images on the screen and avoiding visual inspection of microscopic. The system has an acceptable degree of accuracy, specificity and sensitivity.

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Roles of Public Administrators in Local Community Development

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DOI: 10.29322/IJSRP.10.09.2020.p10565
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10565>

Abstract- The role of public administrators is considered most significant in changing society and administration, however, an efficient, responsive, transparent and accountable public administration is of principal importance for the appropriate functioning of a local community, besides, it is a core part of democratic governance and the elementary means through which government strategizes to accomplish the implementation of its amalgamation objectives. Obviously, local community development today should reflect the changing and competitive nature of national and international strata and the new administrative climate. Nonetheless, it is common knowledge that public administrators play crucial roles in the government provision of essential services such as healthcare, transportation, utilities etc. to the local communities. However, the specific roles played by public administrators in local community development through engagement of citizens, enhancement of technical expertise, mobilization of resources, economic development, consensus building, and development of managerial and executive capacity for sustainability, etc. is still not yet comprehensive. Therefore, this research paper portrays the major roles public administrators play in the local community that lead to local community development.

Index Terms- administration, roles, policy, local, community, conflict, development, resource, allocation, distribution, culture, sustainability, planning, economic, happiness, justice, equity, governance, zoning, arbitration, technology, education, trust.

I. INTRODUCTION

Public administration, according to Marx, could be viewed as a systematic ordering of activities and the planned use of resources geared towards the achievement of a set out goals and objectives, thus, it entails action taken in pursuit of a conscious purpose (Juneja, 2015). Land defined public administration as the arrangement and maintenance of human and fiscal resources with the purpose of attaining group goals (Juneja, 2015). Moreover, Negro views public administration as a cooperative effort in action and covering the three branches of government and as well a political process (Juneja, 2015). While in White views, public administration comprises all those operations with the sole aim of fulfilling and enforcing public policy (Juneja, 2015).

Local community development here is a procedure involving public administration in the collective action and generation of answers to mutual community problems for improvement of their wellbeing and their economic, social,

environmental and cultural etc. benefits ("PeerNetBC", 2018). Thus, it is about balancing the need of the primary challenges of community development by proffering durable solutions with the daily realities that need immediate decision-making and short term action ("PeerNetBC", 2018). The International Association for Community Development (IACD) which is the global network of community development practitioners and scholars define community development as a practice-based profession and an academic discipline that encourages participatory democracy, economic opportunity, social justice, sustainable development, rights and equity, through the organization, education and empowerment of people their communities, be it of locality, identity or interest in rural and urban locations ("PeerNetBC", 2018).

Obviously, it is widely believed that public administrators play essential roles in the federal, state, and local government levels, however, issues of public administration in local governance and participation are seen to play a crucial role in predominant issues of development (Adisa, 2017, pp. 595-597) locally and nationally. Moreover, local community development and local governance structures and public administration (as evidence through public administrators) remains important enablers of the state's capacity to make good its political promises, and as well perform particular functions, thus, the mechanism adopted and enacted at local levels and the public administrators comprising these systems are the passage through which policy becomes action, and by which functions and services of the state that some eventually reached the local communities are apportioned (Adisa, 2017, pp. 595-597).

This research paper in portraying the specific roles of public administrators in local community development will assist public administrators and end users to the understanding of the specific roles of public administrators play to bring about local community development and how to work with individuals and local community members to affect communities positions within the context of larger social institutions ("PeerNetBC", 2018).

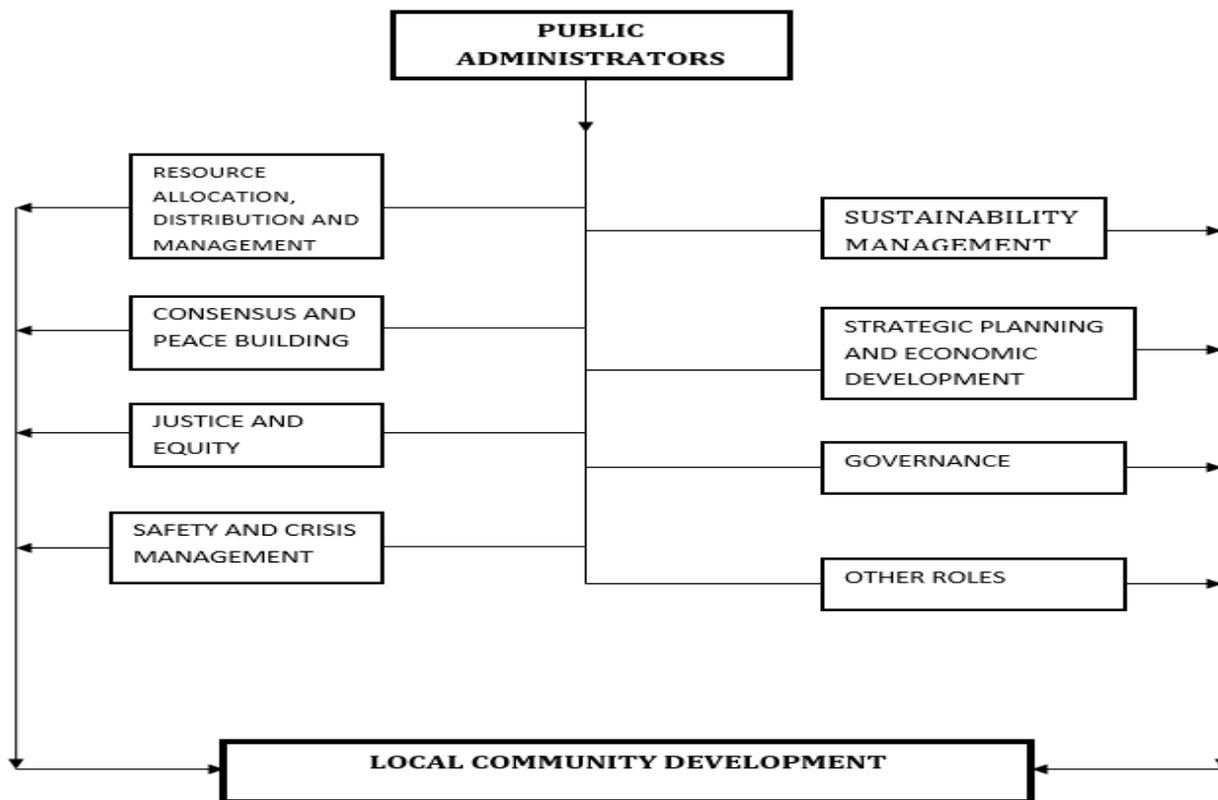
II. DISCUSSION

Public administrators cannot easily be wished away in issues involving local community development because local development is the pillar of national development without which they cookie crumbles irrespective of the efforts being put in place. The local communities are the cornerstones of the state or federal strata. The importance of public administrators in local community development was echoed in the declaration of the

Social Development Summit, a conference that mentioned: a) poverty alleviation, b) generation of productive employment, and c) achievement of social integration especially of the disadvantaged sections such as women, indigenous and the extremely poor, as goals that must be achieved by the nations of the world for the improvement of the quality of life (Copenhagen, 1995, as cited in Mizanur, 2015). Therefore, administrators' responsibilities of working in closer alliance and more systematically with government and the local communities to achieve these objectives should be noted. With this mandate more responsibilities are placed on the shoulders of public administrators to empower individuals and groups with the knowledge and skills they require to effect change within the communities, through the formulation of social working groups for a common agenda, so, understanding the roles of public administrators become more pertinent ("PeerNetBC", 2018). Usually citizens especially those at the local communities keep their eyes on government, examine and judge government performance, and change preferred of level of acceptance and

bureaucratic discretion accordingly (Brennan, Cooper & Knotts, 2008, pp. 459-461). Moreover, the local community members are conscious of the public administrators' efforts towards social change, accordingly, the success of community demands that public administrators develop institutional frameworks and infrastructure that support community decision-making reached through collaboration over time (Carnall, 1995; Denhardt & Denhardt, 1999; Greiner, 1967; Kotter, 1995, as cited in Lebrede, Van Wart & Wang, 2014, pp. 340-355).

The impact of public administration are felt in major local community development element areas such as resource allocation, distribution and management; sustainability management, conflict management, diversity management, consensus and peace building, good governance, strategic planning, economic development, social equity, safety and crises management (Norwich University Online, 2017). The chart below shows the representation of the essential roles played by public administrators in local community development.



Resource allocation, distribution and management

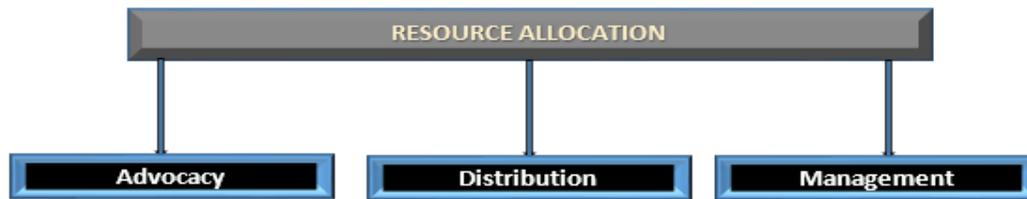
Resource allocation is the process of the division of and distribution of available, limited resources such as human resources, financial resources, material and equipment, to competing alternative uses that satisfy unlimited wants and needs for the attainment of specific objectives for the development of the local communities (Abdel-Aziz & Shugair, 2015). However, due to the fact that resources are innately scarce, it is unusual to satisfy every want and need with available resources, therefore, prudent choices have to be made. Moreover, the achievement of equitable resource distribution depends wholly on the incorporation of the

public in the decision making concerning the process of allocation, however, this incorporation allows the available resources to be integrated specifically where they are needed for best outcomes, and also allows local resources detected and perhaps combined for local usage (Abdel-Aziz & Shugair, 2015).

Public administrators as the middlemen between the government and the local communities advocate for the allocation of resources for the local communities in need, they assist in convincing the government and policy makers on the importance of allocating resources to the most important communities

especially those in dire need (Bland, 2007, pp. 2-130). They frequently communicate community needs to their superior to ensure that they were not left out in the allotment of

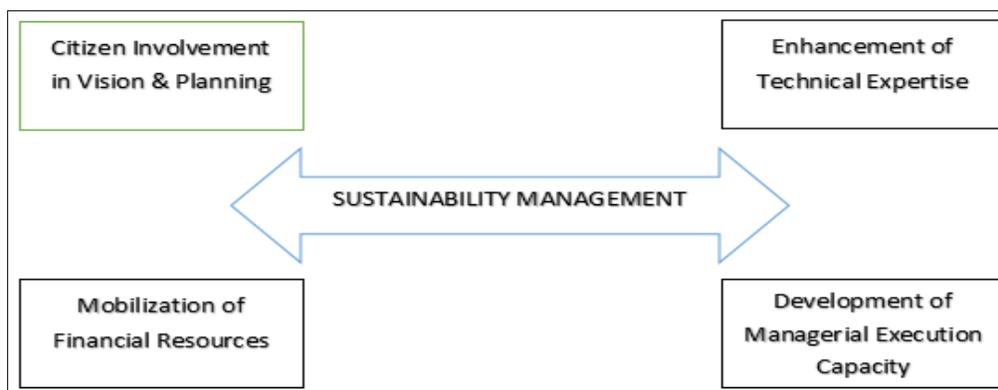
basic resources such as food, medicine, water, money and shelter, or even establishments (Bland, 2007, pp. 2-13).



Public administrators occasionally work directly with local community members and during resources allocation and distribution to ensure even sharing, besides, they work in cooperation with private agencies or organizations in creating processes and procedures for equitable resource sharing (Kent State University, 2002). In the case of scarcity of resources, public administrators has the discretion on the best and conflict free way to distribute available resources. Accordingly, Teaster asserts that public administrators are Surrogate Decision Makers in that they make essential services decisions not necessarily based on a regular pattern but based on the natural occurrence of an event such as a new ward entering into the system, wards becoming ill, or other factors that might come up (Brăgaru, 1989, pp. 887-888). Public administrators assist in the management of available human, natural and financial resources (Adisa, 2017, pp. 595-597) to prevent slacks, mismanagement and corruption, besides, they help in the location of available resources, determination of level of funding and planning available in the event of emergencies (Barăgaru, 1989, pp. 887-888). Public administrators assist to ensure that responsibilities are matched to resources and to results which is necessary as the most preferred means to capacitate the public service to respond to its local development needs, and in building managerial platform for regular interaction with residents, communities, civil society and the private sector (Barăgaru, 1989, pp. 887-888).

engagement in policy efforts to include local communities, development of organization capacity, and the encouragement of broad adoption (Lebrede et al., 2014, pp. 340-355) of sustainability initiatives. Public administrators pursue public awareness in the local communities and make them sensitive to recognize need for change in environmental deterioration and natural resource depletion, and they enable various local communities to come together for the provision of solutions that are suiting to local conditions and opportunities, and to make it feasible for the sustenance of administrative practices over the long-term (Lebrede et al., 2014, pp. 340-355).

In sustainability public administrators' roles also encompass the involvement of community members and/or citizens in visioning and planning, the development of technical expertise and implementation, mobilization of financial resources, and the development of managerial execution capacity (Lebrede, et al., 2014, pp. 340-355). More so, public administrators assist in sustainability through engagement of local community members and other relevant stakeholders, utilization of insights and best practices of technical experts (Lebrede, et al., 2014, pp. 340-355), that will result to improved implementation of sustainability practices and indirectly lead to positive sustainability outcomes (Lebrede, et al., 2014, pp. 340-355). More so, they assist local community members and groups in discovering sustainable ways of meeting social, economic and material wants for the improvement of their lives (Adisa, 2017, pp. 595-597). Furthermore, they oversee the stewardship of lands, mineral and



III. SUSTAINABILITY MANAGEMENT

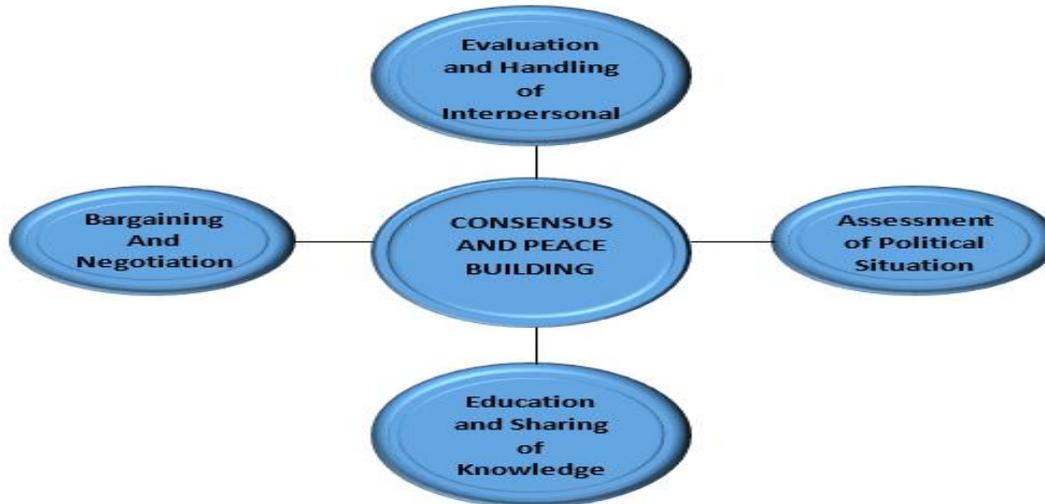
Sustainability is the promotion of a range of concrete environmental, economic and social practices, overtime, by a broad selection of actors with differing mutually supporting beneficial outcomes in communities (Lebrede, Van Wart & Wang, 2014, pp. 340-355). Besides, sustainability management involves

natural resources, infrastructures, health system and delivery procedures etc. to ensure their effectiveness and stability, for example, public administrators were the first to raise the issue of environmental concerns that later led to the establishment of the Environmental Protection Agency (Norwich University Online, 2017).

IV. CONSENSUS AND PEACE BUILDING

Quintin (2012) defined consensus building as a community process where stakeholders build consensus on actions to address public policy problems. Public administrators assist in leading the local community and elected officials in vision processes - a process where members of the community build consensus on the explanation of the community's preferred future and on measures for the attainment of the future goals (Quintin, 2002), through public discussions, public hearings, deliberations and training to appreciate and promote participation (Nalbandian & Oliver, 1999; Ryan, 2007, pp. 2-13). Nonetheless, they are involved with assisting in local community participation, development of

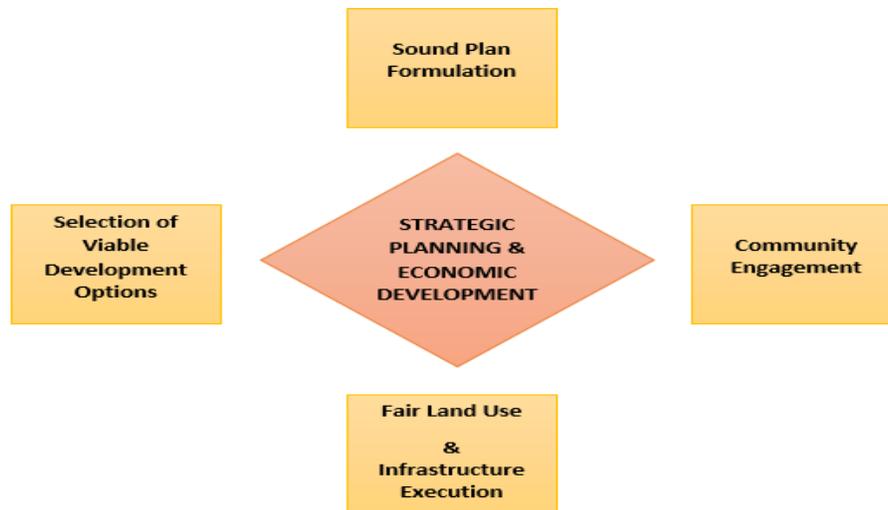
partnerships, representation and equity, however, the involvement in their process of consensus building comprises; a) the evaluations and handling of interpersonal relations, b) bargaining and negotiation, c) analysis of community's political situation, and c) education and sharing of knowledge (Bland, 2007, pp. 2-13). Public administrators act as pivot to individuals that require it, however, they act as guardian or conservator particularly for vulnerable populations that have no person or family to speak for them (Kent State University, 2002) to ensure that they are not left out in the cold in community benefits. Besides, they communicate local community needs and as well initiate policy proposals directed towards local community development (Bland, 2007, pp. 2-13).



Peace is essential for the attainment of any community development initiative because without peace there will only be diffusion of ideas, chaos and anarchy, crisis and conflict and erratic conditions. Obviously, peace is the pillar of every community building plan and it is important for the deliverance of political promises along with the desirable public goods such as welfare, healthcare, education, security and infrastructure (Peace Building Initiative, 2008). Accordingly, there is the likelihood that fragility could arise because of the state's incapacity to deliver services or government decisions viewed as unfavorable by a segment of local community that could result to tensions within the local communities, therefore, public administrators help to ensure that tensions can be mediated through peaceful processes (Peace Building Initiative, 2008) devoid of violence and protracted bickering. The reign of peace in the local communities facilitates the establishment of mechanisms of political involvement and general policies, the effective provision of elementary services and goods, free, fair and transparent elections, anti-corruption activities, promotion of local governance and the nurturing of a widely accepted democratic culture (Peace Building Initiative, 2008).

V. STRATEGIC PLANNING AND ECONOMIC DEVELOPMENT

Strategic planning is predicting a desired future, and the translation of this vision into generally defined goals, outlining a series of steps to accomplish them (Blair, 2004, pp. 102-111). Undoubtedly, due to dwindling public resources coupled with the paradigm in the responsibility for economic development from state to local levels, there is intensified competition for private sector jobs and investment, therefore, strategic planning enable communities to concentrate on the development options of their choice (Blair, 2004, pp. 102-111) for optimum outcome. Nonetheless, public administrators help many local community leaders to clarify their roles in economic development by formulating plans frequently using strategic planning approaches – which are set of methodical techniques that assists an organization to advantageously position itself in competitive and changing environment, as it provides the organization with the needed framework to study its environment, establish missions and goals, identify stakeholders, analyze its strengths and weaknesses, for the development of action oriented implementation plans (Blair, 2004, pp. 102-111).



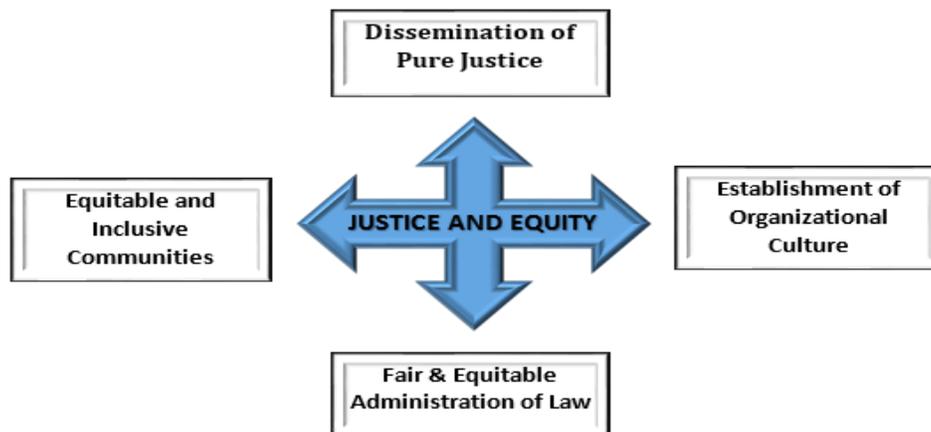
Public administrators encourages the engagement of community members in the strategic planning process, accordingly, a study of Oregon’s program indicates that local strategic planning can help communities adjust to social and economic transformations (Kissler et al., 1998; as cited in Blair, 2004, pp. 102-111). Moreover, in the study of six different strategic planning programs in Nebraska found that strategic planning is a function of the degree of local implementation process, however, effective citizen participation demands for continuous and high levels of local commitment (Gilat & Blair, 1997; as cited in Blair, 2004, pp. 102-111).

Public administrators help local communities to involve in economic development through a methodological use of various efforts geared towards the simulation of private investment in order to enhance employment, diversify the area’s economy, broaden the tax base and improve the quality of life (Blair, 2004, pp. 102-111). Furthermore, public administrators where concerned in the creation of jobs by the private sector in the local communities, can play a part by making sure that the jobs are created fairly and with equal opportunity to various stakeholders (Kent State University, 2002). Moreover, they are occasionally responsible for determining fair land use in a local community, or

for developing a workforce organization solution, or leading infrastructure development execution that will ensure a safer, more productive workforce (Kent State University, 2002).

VI. JUSTICE AND EQUITY

Obviously, societal members and citizens normally expect the resolution of conflicts involving them and within groups to be decided in accordance with the rules accepted within the given domain (Hampshire, 2000, as cited in Spicer, 2014, pp. 449-459), and they expect such resolution to be on the dissemination of pure justice without fear or favor. Besides, when individuals in a particular setting are given equal treatment without regard to race, gender, religion, culture or ethnic origin, etc. they become friendlier, agreeable and produce their best with optimum performance and as well become more accustomed to the environment (Hampshire, 2000, as cited in Spicer, 2014, pp. 449-459). Thus, “creating equitable and inclusive communities with opportunity for all can lead to a level playing field where everyone has a chance to succeed” (Bilharz & Wooldridge, 2018, pp. 2-5).



Public administrators assist local communities in the creation of an organizational culture that accepts, welcomes, and

encourages sincere dialogue, and the cultivation of a question behavior by encouraging community members to challenge the

traditions and actions of the body (Hampshire, 2000, as cited in Spicer, 2014, pp. 449-459), necessary for the promotion of justice and equity. Certainly, injustice and inequality undermines trust in the community, and disintegrates social bonds, erodes, friendship, diminishes civic participation, and weakens trust in government, moreover, they promote status competition, social divisiveness, and weakens the will of the majority for organizing and defending common interest against the specialized interests of the few (Bilharz & Wooldridge, 2018, pp. 2-5).

Apparently, the role of public administrators in local community justice and equity when viewed from a larger perspective seem to be more significant because of the negative impact of injustice and inequality in the local community. Because when feelings of injustice and exclusion pervade a culture, the community shows reduce levels of trust, weaker community connections, lower quality of social relationships and cooperation, and feelings of disrespect between individuals-all of which may trigger violence and jeopardize economic and political stability (Wilkinson, 2011; as cited in Bilharz & Wooldridge, 2018, pp. 2-5). Certainly, injustice and inequality within a local community context could have spill-over effects into other areas, even encroaching wider nationally and perhaps internationally, examples are regional conflicts in certain parts of Africa, Asia, and America (Buss & Ahmed, 2011; as cited in Bilharz & Wooldridge, 2018, pp. 2-5). More so, research has found that negative psychosocial effects of toxic stress, psychotic symptoms, and depression are directly proportional to the level of inequality in the society (Piff & Wilkinson, 2014; as cited in Bilharz & Wooldridge, 2018, pp. 2-5).

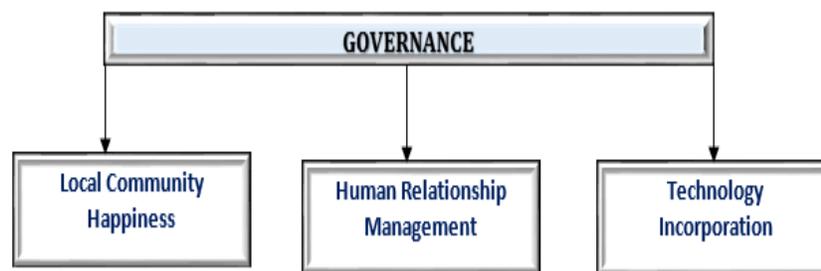
Consequently, public administrators consolidate their civic duties within the local communities by assisting to ensure that laws are administered fairly and equitably, and that equity is promoted through the maintenance of a diverse workforce with equal opportunities to all members and provision of moral leadership and inspiration of all members and citizens to behave fairly (Sharfrit & Russel, 2007; as cited Bilharz & Wooldridge, 2018, pp. 2-5). Public administrators helps to usher in justice and equity in the local communities through collaboration with the media, reports to officials, public statements, and other activities, that emphasize justice and equity, continuously raising awareness on the unfavorable impact of inequity, thereby giving local

community members and stakeholders the knowledge and tools to normalize attention equity issues and as well embed equity within policy considerations (Bilharz & Wooldridge, 2018, pp. 2-5).

VII. GOVERNANCE

Good governance is the soil nutrient that nourishes all local community development efforts and initiative, good governance is the soil that grows the plants green without which all efforts both by public administrators and community members, might become futile. Truly, good governance is essentially for meaningful socio-economic development and the erecting of a harmonious society free from the turbulence of violence and terror, and for the establishment and sustenance of justice and fair play nourished by mutual understanding and cooperation's of community members, citizens, government and the relevant government agencies (Mizanur, 2015). Bad governance can result to heightened level of unhappiness that could degenerate to the point of leading local community members to embrace violence and conflict on the basis of religious, communal, ethnic and cultural differences, just as it happened and still happening since the 1990s in different states of Africa, Eastern and Central Europe, and Central Asia (Mizanur, 2015).

Public administrators' as agents of governments help increase the happiness level of the local community by taking steps that will make them happy by assisting them to make appropriate choices and choose favorable options, and nudge them in the right direction (Okulicz-Kozaryn, 2016, pp. 198-202). In addition, public administrators equipped with the appropriate skill set, help local communities to acquire new methods of managing human relations in a diabolizing society, and to develop and apply essential skills to halt the spread of violence and conflict arising because of ethnic, cultural or religious differences in a heterogeneous community (Mizanur, 2015). Furthermore, public administrators help local communities' members to "attain greater happiness without paternalism, only by helping people make better and informed choices" (Thaler & Sustein, 2008; as cited in Okulicz-Kozaryn, 2016; pp. 198-202), and by promoting the course of direct democracy.



In some local communities public administrators have been identified to play expanded roles in the incorporation of technologies in public services through affiliation with notable banks and development agencies to bring development to the recipients local communities, for instance World Bank Broadband Internet has significantly improved medical services at Vaiola Hospital, Tonga; the reconstruction of a village at *Yogyakarta, Indonesia* (Robinson, 2015, pp. 4-15), and there has been an

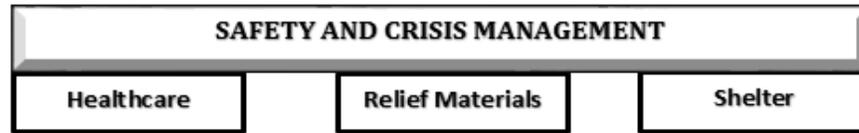
increase in the provision of cycles on rent to communities as a means of public transport (Robinson, 2015, pp. 4-15).

Safety and crisis management

Public administrators and local community health officials cooperate to ensure adequate healthcare provisions and/or coverage at a lower cost, however, they ensure that doctors and hospitals adhere to the relevant federal and state laws, and they

are responsible for oversight of doctors and healthcare professionals to ensure that they are following regulations at all times (Ohio University, 2019). Furthermore, they are responsible for Social Determinants of Health (SDH) thus addressing the fundamental of poor health before health problems occur, however, in furtherance of their healthcare efforts they facilitate

free food lunch programs that offers students access to at least one healthy meal each day, provide expanded access to local markets with emphasis on locally obtained foods and engages in clean water initiatives that enhances community health (Ohio University, 2019).



Some public administrators are trained to possess the ability to forecast and plan impending disaster in the event that they come to fruition (Norwich University Online, 2017). Moreover, public administrators have the civic responsibility of reassuring local community members and residents to be less panicky of any foretold imminent disaster, and to provide effective crisis management in the event of the occurrence of major crisis or disaster by taking measures that reduce the economic and health effect of the calamity (Norwich University Online, 2017). They assist in the distribution of relief materials such as food, medicine, water, and shelter, and the rescue of trapped individuals or families, and they organize efforts to improve communications between public administrators, safety officials and local residents (Norwich University Online, 2017) with the spirit of fairness, equity and sincerity, an example is the remarkable roles public administrators played in the post-Katrina - a reconstruction effort that ignored creed, ethnicity, sex, religion, racial character and elitism (Reed, 2016, pp. 260-273).

VIII. OTHER ROLES

Conflict management has been identified as another area where public administrators has a felt impact on. There is the likelihood for conflict to occur in a local community setting due to different reasons such as resource allocation and/or sharing, distribution of basic needs, location of facilities, welfare, etc. that might have unfavorable consequences. Thus, public administrators help in marshaling the procedures of effective conflict management structured to placate every dissenting voice and replace brute force, domination and tyranny (Spicer, 2014, pp. 449-459). Besides, where applicable they assist in the training of community leaders on the methods and techniques of conflict management because often lack of conflict management skills contribute to the escalation of conflict and even the application of force and violence in their resolution (Zagar, 2006; as cited in Klinec & Radivojevic, 2015, pp. 108-114).



Public administrators also help to foster the spirit of *trust* among community, thereby expanding their willingness to accept government and authority (Kim, 2005; Ruscio, 1997; as cited in Brennan et al., 2008, pp. 459-461). According to some scholars, trust can resolve the tensions between accountability and flexibility by broadening local community members/citizens wiliness to accept authority (Kim, 2005; Ruscio, 1997; as cited in Brennan et al., 2008, pp. 459-461). Moreover, the work in collaboration with local community members in reaching a zoning formula accord, avoiding expensive and length litigation because zoning has always been a source of conflict within the government, accordingly, zoning decisions affect the ways in which communities develop (Oliver, 2001, as cited in Brennan et al., 2008, pp. 459-461).

IX. LIMITATIONS

This research paper was done using mostly online resources, therefore, it lacks qualitative empirical evidence in the form of sample outcomes based on respondents' responses to buttress some of its findings on the public administrators' roles in local community development, to ascertain that they are in line with the research findings of other scholars who may have done a study in the role of public administrators in local community development. Moreover, more literature review may be needed to understand what is lacking in other peers studies in the role of public administrators in local community development. Also due to time constraint, this research paper has a limited focus on the role of public administrators' in local community development in

the underdeveloped and developing countries that may operate differently from those of the developed countries.

X. CONCLUSION

Understandably, public administrators play distinct roles in local community development, facilitating shared responsibility and pursuit of mutual benefit among members and citizens, and the interaction between different private groups, individuals and entities in the provision of essential services to the local community (Juneja, 2015). Obviously, public administration serves as a fulcrum to almost all the local community development efforts, as it helps in the building of community capacity in order to take care of important issues and as well take advantage of development and growth opportunities, find common solution and balance competing interest ("PeerNetBC", 2018). The role of public administrators are in line with Goodsell views of playing crucial roles in the intrinsic satisfaction of local community members by engaging in activities that brings about social services leading to the provision of shelter to the homeless, food stamps to those in hunger, clothing to those without, jobs for the acutely unemployed and disenfranchised (Brăgarau, 1989, pp. 887-888). Actually, public administrators facilitate community engagement, social capital, nonviolent direct action, asset-based community development and community organizing etc. and work with community members, citizens and groups within the community to discover sustainable ways of meeting their social, economic and material needs and to improve the standard of their lives, build their communities, protect their environment, improve personal safety and eliminate poverty (Adisa, 2017, pp. 595-597). More so, public administrators through their promotion and cultivation of partnerships that involve local community responsibilities and its relationship with other organizations, associations, and groups, they act as facilitators and alliance builders (Adisa, 2017, pp. 595-597). Besides, they build the needed managerial platform that frequently interacts with local community members and residents, civil society and private sector in order to facilitate response to the local development mandate (Adisa, 2017, pp. 595-597).

Certainly, local community development remains an important condition of guaranteeing the geographical spread of human development; therefore in the future public administrators will continue to be bestowed with the responsibilities [at least in part] of striking a balance between traditional approaches of oversight and efforts and prevention through environmental factors (Ohio University, 2019). The technological, societal, political, and economic changes require broader public administrators' involvement in local communities by laying more emphasis on cultural diversity, people consciousness in identity, meaning and relationships, political representation, participation, openness and local community involvement in decision making to deal with these changes (Universiteit Leiden, 2007).

Furthermore, public administrators challenge of the 21st century is vitalization of political progression through the establishment of an efficient system of leadership and governance by redesigning local community organizations, creating processes for better human interaction and relationships, and the expansion of conditions for dialog, change, and problem solving (Universiteit Leiden, 2007). Therefore, the development of capacity for cognizant learning and undergoing change through a critical

reflection upon their actions, and continuous engagement in renewal by active participation in the local and national environmental setting is expected from public administrators (Universiteit Leiden, 2007).

Although public administrators have been involved to a certain extent in the complementarity of digital governance with a revitalized approach to the co-production of public services that identifies its potential to generate genuine user and citizen engagement in public service delivery (Osborne, Rador and Nasi, 2013; Robinson, 2015, pp. 4-15) within specific local communities, there is need to adopt and adapt to e-government as one of the best method of improving the quality of public services to local communities while cutting the costs in the public administration, therefore, public administrators must have the capacity to offer local community members and enterprises with quality public services through information communication technology (Adisa, 2017, pp. 595-597), however, this strategy of governance through public service delivery enhances transparency, accountability and effectiveness.

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Effects of Materials Management on Performance of Selected Construction Projects in Rwanda

A Case of Selected Sites of Baraka Properties Ltd.

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DOI: 10.29322/IJSRP.10.09.2020.p10566

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10566>

Abstract: This research project examined the contribution of material management practices on performance of construction of project. Specifically, the present research assessed the effects of material estimation costs on project performance, the effect of procurement on performance of construction project and examined the effect of inventory control on performance of construction projects. Both descriptive and correlational research designs were adopted where qualitative and quantitative approaches were applied. Data collection instruments that used were questionnaire, interview guide and documentary analysis. The target population was 200 contractors and 180 subcontractors. The sample size was 195 respondents. Furthermore, information was analysed using Statistical Package for Social Sciences version 21.0. Results evidenced a positive and significant correlation between material estimation cost and performance of construction project at Baraka Properties was 0.518. A positive and significant correlation of 0.884 was also obtained between procurement process and project performance. The results also indicated that the coefficient correlation between procurement process inventory control and project performance was 0.874. It was recommended that contractors should be careful with the problem areas that positively impact cost management, recruitment of qualified workers in managing and analysing costs. It was suggested the necessity to utilize inventory control systems, construction companies have to enhance their budget allocate to capacity building and career development in order to ameliorate required knowledge and skills for workers. It is pertinent to implement information technology that is helpful in disseminating information and quickening orders from supplies. Future studies are pertinent to assess the efficiency of these strategies to management project cost.

Key words: Material management, building material, material planning, material estimation cost, procurement, inventory control, Rwanda

1. INTRODUCTION

Globally, construction sector is one of the main element for investment. Previous evidence demonstrate that the construction outcome develop specifically rapidly, sometimes

beyond the proportion of economic development, entirely as countries positioned their fundamental infrastructure in place to stimulate development. Worldwide, the construction industry outputs was, by 2013, estimated to be 10% of the global GDP approximately US\$ 7.5 trillion (MINICOM, 2013). The global construction sector contributes about 6% percent of global GDP and these estimates would grow to 15 percent by 2025 (WEF, 2016). The countries with high growing rates will be China, India, Russia, Brazil, Poland and USA.

Construction industry is among the most intricate and difficult sectors in the world. Shehata & Gohary (2011) reiterates that construction performance impacts the production level of all sectors of economic activities. However, several problems which construction sector is encountering are many. The main construction sector concerns are raw material prices, skills of workforce, technology, resource scarcity, climatic change and urbanization and corruption.

Rwanda as a member of East African Community procures additional construction materials from the member states. There is high competition for construction materials within the region. For instance, cement from Uganda is a big competitor for Rwandese cement manufacture. According to Rwandan Ministry of Trade and Industry Report (MINICOM, 2013), among the contractors, the major competitors are local companies (57%), Chinese companies (29%) and the Indian granite industries (14%). Competition challenges are mainly due to lack of machines to improve quality and quantity of production (40%), limited access to markets (20%), and lower prices offered by competitors (20%) (Carver, & Nash, 2009).

The construction sector in Rwanda is growing faster and faster, while construction materials comprises a great cost element in construction project delivery, cost of materials may be 50 percent to 70 percent of total construction cost relying on the type of projects (Patil, 2013). This sector is an impeding one than other sector of economy owing to exclusive nature of any project and several antagonistic patties are tangled and project is inhibited by time, money quality and high risk.

Latha (2014) reiterates that material management is a step to plan, to implement and to control field and office actions and tasks related to the construction. Zeb (2014) describes managerial construction as a process for implementing, designing, planning and following up site tasks in any construction project. Flanagan (2009) separates material management into five integral classes like to measure, to specify, to procure and purchase goods where the order was transformed into supplier, provision to site and logistics of verifying orders, off-loading and stocking, managerial financial procedures of payment and usage of equipment in production at working place and removal of unused materials.

The growing problem around which this study turns consists on low performance of construction project. In fact, higher project cost (Ndegeya, 2015), inability to meet project time schedule (Patil & Pataskar, 2013), and poor quality assurance for construction projects (Jarkas & Bitar, 2011) were evidenced to be among indicators of poor performance of construction projects. Furthermore, construction projected failed due to failure ordering on time, over ordering, inadequate materials, bad measurements, stealing materials, cash flow issues to contractors owing to delay in payments. Previous studies conducted in Rwanda, problems of materials management caused the fall of four storey building in Nyagatare district and of a multi-storey block at the University of Rwanda, (MINALOC, 2013; Ezhilmathi, 2016; Ndegeya, 2015).

Scholars argued that in order to improve the performance of construction projects, several strategies must be adopted. These are: effective material estimation cost (Meng, 2012), adequate procurement (Nagapan, 2012), and appropriate inventory control (Mincks & Johnston, 2011). However, no studies in Rwanda have been conducted to investigate the adequacy, effectiveness and effects of those practices on the performance of construction projects. In search of ways to resolve this problem, the present study investigated the effect of material management practices on the performance of construction project in Rwanda.

The specific objectives that guided this research were

- i) To assess effects material estimation cost on performance of construction project in Rwanda
- ii) To determine effects of procurement on performance of construction project in Rwanda.
- iii) To examine effects of inventory control on the performance of construction project in Rwanda.

2. REVIEW OF RELATED LITERATURE

2.1.1. Material Management Practices in Construction Project

Material management is referred to as one of the greatest elements in the performance of construction projects. In this context, it's evident that material cost stands from 30% to 70% of the entire project expenditure (Flanagan, 2009). Construction material comprises of different raw materials acquired from several markets. However, their prices and presence are volatile due to certain circumstances of market conditions (Christopher, 2011).

Nowadays due to technological development, construction material necessitates to explore the international market

globally. Raw materials will be reversed in favour of engineer elements and mixed gatherings (Calkings, 2009). Then, after choice of materials till last product was produced it include a group of transformation which is defined as material management. This set comprises of storing, identifying, retrieving, transportation and construction techniques (Pellicer et al, 2013) The term material management refers to the process of designing, planning and controlling to be sure of the high degree of quality and quantity of materials determined in a given scheduled time (Donyayi & Flanagan, 2009) Furthermore, relying on evidences from different scholars, appropriate material management is one of the pertinent elements to the performance of construction project (Gulghane, 2015). Therefore, a great number of studies elucidate that appropriate material management could lead to a higher level of production of the project and stimulate its higher performance (Pande & Sabihuddin, 2015).

However, the following are among the greatest impediment in construction project in Rwanda: Lack of skilled personnel; dependence of external professionals; absence of domestic construction materials and lack of suppliers in the marketplace; lack of developed and advanced infrastructure and scarcity of spaces and storage in the country (Doloi et al., (2012). Finally, the aforementioned elements affect negatively the degree of awareness of the necessity of material management practices in Rwandan construction sector (Abdul et al, 2013).

2.1.2. Material management processes and techniques

Scientific evidences show that material management comprises of a group of procedures that need to be integrated, administered, managed and assembled (Patil, 2013). The stating point of all phases in material management is planning. This must be assessed for the purpose to afford guidance to all components of activities. In a study of Gulghane (2015), material planning involves the quantification, ordering and scheduling of materials and activities to be carried out. In this regards, the usage of appropriate material management stimulate higher production and profitability to any construction companies and this can render them to high level of performance (Kasim et al, 2005).

On the pursuit of adequate material management, quality of service is a pertinent measurement of project. Respecting standard of construction materials is very pertinent to the establishment of a rigour sustainable and cost effective structure where every construction project had various setting of specific obligation to fulfil (Patil, 2013). Contractors must choose and undertake procurement adequately taking into consideration construction materials. It is recommended to carry out a research and assessment of various material properties to see whether they are compatible with various sites of buildings. Procurement of construction materials must be delivered after approval (Low, 2014). Procurement refers to appointment of contractors and preparation of a contract but it is very important as the first step of delivering procedure (Mead & Gruneberg, 2013). All tasks procedures start from purchase of materials, services and other necessities pertinent to the construction project and their execution (El-Gohary, et al, 2014).

Several companies, vindicate that construction materials and components obtained from external supplier have a paramount percentage of the cost of the end product and adequate procurement is positively improving the competitiveness of any construction project (Rivas, Borcherding, Gonz´alez and Alrcn, 2010). Various researchers proposed that the selection of a suitable strategy of procurement is helpful to the reduction of effects occurring from circumstances like delay in delivering, low standard of raw materials, low quality, few resource and many others.

Logistic refers to the movement and comprises of planning, execution and follow up and storage of all materials from raw to the finished ones to attain the expectation of clients (Safa et al, 2014). Planning all the aforementioned activities is helpful to the formulation of an effective construction site layout that may afford easy accessibility and transmitting materials in the site. Therefore, for controlling the accessibility and to augment security of the site, setting up wall or fence is taken into consideration as a prerequisite (Caldas et al, 2014) and planning of access and transmission of material on the construction site (Kasim & Ern, 2014) are elements that necessitate to be the focus during logistics for adequate material management.

Different materials had not the same characteristics and properties that render handling of materials to be problematic. Suitable material handling includes handling, storing and control of construction material (Karim & Ern, 2014). Adequate guarantee during storage is sometimes not considered and this lead to low quality of materials or its decline and worsening. It was proposed that the storage are necessitates for enclosing, cleaning and drying adequate air condition and for some material had to be stacked on pallets and without humidity (Low,2014). Further, the control of material wastage is very important in controlling the construction cost. Calkins (2009) specifies that material waste is estimated to nine percent by weight in Dutch construction sector and between 20 and 30 percent of purchased materials in Brazil. Material waste emanates from planning, procurement, material handling and operation procedures. Benton & McHenry (2010) specified that construction materials wastage is not the same with the value of material provided and approved on the construction site. Material waste was seen as a main and growing issue in construction project and it may lead to ineffectiveness of construction project delivery. Appropriate control will be helpful to the enhancement of production and can ameliorate waste control in the construction (Kasim, 2011).

Through the minimization of procurement cost for construction materials, a reduction of general cost of project occurred and improving the profitability of a company, suitable time to take into considerations as whether material ordered too early, it can influence financial capital, interest rate and storage costs (Del Pico, 2013), lack of standard or low quality in material management lead to the enhancement of construction cost. This was due to opportunity to loose material during handling and execution steps are more than other and it needs material replacements (Othman & Potty, 2014).

Planning and procurement are deemed to be pertinent procedures that follow up and monitor the overall cost of construction project. Material control and expedition is one of the paramount step and is preventing shortage and surplus of material appeared on the construction site. Time is described as the level that overall working environment enhanced the achievement of a construction project on time (Said &El-Rayes, 2012). It is the beginning of signing contract where most of them had the same content regarding the time schedule for achieving and executing the work where it is very necessary to realize the work on time. Time can be acknowledge as the ultimate measurement of project success and sustainability (Melton, & Iles-Smith, 2009), the lack of respect of time scheduled necessitate to reorder materials and lead to the prolonged time of consuming materials. Lack of respect in time assigned to a project lead to the enhancement of working expenses and the procurement decreases idling time and suitable materials adjustment decreases extra time for modification of resources (Nwachukwu, 2010).

Lacking a suitable and enough material can put a risk at the appropriate quality of duties assumed by employees. (Hughes, 2014). Same as the materials necessitates being adequate quality based on their main characteristics (Nagapan, 2012). The adoption of adequate quality of construction materials stimulate the satisfaction of the quality of construction activities and will be approved by engineers (Mincks & Johnston, 2011). All in all, available resources could be related to specifications, satisfactory quantity and function

2.1.3. Causes of ineffective material management

Jarkas and Bitar (2011) proposed that transport complexities, waste, inadequate handling on site, misuse, improper working design, waste inadequate material delivery and excessive working paper all lead to the ineffective material management. In a research undertaken by Wanjari and Dobariya (2016) agrees the general pertaining issues in material management is inability for ordering on time which lead to the delay in project implementation, wrong direction of delivering , over ordering, inadequate materials or stealing materials and double handling of material due to inadequate .

Moreover, a research carried out by Patil and Pataskar (2013) pinpointed that the problems could emerge owing to error, particularly due to some construction firm still focus on manual methods for management that comprise paper based methods. A research carried out by Potty and Ramanathan (2011) on the challenges in material management used six case studies. Findings under this research revealed the greatest impediment to the material management are associated with challenges site and site logistics concerning the material handling and allocation and order and provision of construction materials on the site.

Another evidence from Patel and Vyas (2011) shows that the planning, procurement, vender choice and execution steps if not done in appropriate ways, they can bring huge problems to the material management. In light with the above information, the correlation between those problems and ineffective material management has been revealed (Durdyev & Mbachu, 2011). Furthermore, to ameliorate the construction project delivery in Rwanda, future studies must assess important of ineffective material management at each step.

2.1.4. Project performance

Meng (2012) explains that project performance is assessed through its product and project usage quality, timeliness, budget compliance and degree of customer satisfaction. Low and Ong (2014) evidenced that managerial limitations, managerial time and management related costs, performance of managerial skills, risk management, management of human resources and incorporation in relation to the project success where he gives strong correlation. In evaluation of the performance of project, the time schedule contributes more to the assessment and relying on (Punch, 2014) the maturity in time management routines lead to the durability in project performance where time frame is not routinized.

The timeframe is very important to achieve the project target. The phenomenon of not delaying in executing project is linked with the time schedule. Cheng (2014) and Del Pico (2013) evidenced that project in construction section is attained due to a set of various factors like procurement process, adequate working conditions, financial resources and effective plan and effective monitoring and evaluation.

The quality of projects information had positive effects on project success (Rashfa, 2014). Therefore, associated with the quality and technical obligation is limitation. The achievement of project in interior of the time scheduled is seen as a motivating factor of project durability and performance. The plan of time is very pertinent to realize project goal and outcomes in a specified period by taking into consideration the project fixed objectives (Walker, 2015). Performance refers to the determining and promotion of success and assessment output relying on the fixed objectives assigned to any project (Othman & Napiyah, 2014). In this context, performance refers to the individual or group fetching taking into consideration the cooperation toward positive outcome. Performance achievement is the process of the long journey and the level of explanation of the method in which the degree of attainment take into accounts six integral elements like nature of skills, knowledge, identification, features and constant components (Gunduz, Nielsen & Ozdemir, 2013).

Another crucial dimension in project performance involves the level of customer satisfaction (Keith & Kling, 2016). A project that in the final analysis stimulate customer satisfaction would be evidenced to perform well. In monitoring the success of any project is profitable to the stakeholders and shareholders by facilitating them to approve the service obtained to safeguard managers by ameliorating service they provide to customer (Said & El-Rayes, (2012). Project performance is related to the end product objective in terms of success and realization the prerequisites as well as satisfaction of clients. Therefore, project success lead to its sustainability and durability in terms of obtaining a competitive advantage, improvement of reputation for a firm, enhancing market share and attaining certain level of profitability (Kirkpatrick & Feeney, 2015). Project manager whose individual profile was to the ideal project manager for a specific project type was performance in effect on customer (Cooke & Williams, 2009).

2.2. Empirical literature

A study carried out by Khandve (2015) in India to assess the effects of material estimation cost using a qualitative

approach. It had a sample size of 200 construction companies. The study explored the effects of estimating costs on the performance of service delivery. The author specified that material estimation lead to the adequacy and effectiveness of services provision. It also show a strongly correlation between material plan and high level of production and profitability of the company.

Another study undertaken by Moldavian scholars (Mincks & Johnston, 2011) reiterates that cost estimation lead to the effective forecasting relying on the availability of information. In USA, an association of engineers published a report on the effects of budgeting and its preparation to the success of construction companies. In this regards, there is a need to formulate the ultimate goals for budget preparation in order to meet what companies have in the inventory storage (Jarkas & Bitar, 2011). However, budgeting for materials is achieved relying on annual, trimestral or semestrial information and expenses and this can stimulate construction project to be sustainable and successful.

A study carried out in South Africa by Walliman (2011) assessed the influence of procurement on performance of construction project. A sample size of 72 companies participated in the study. The study assessed whether appropriate procurement procedures between contracting parties is very adequate to stimulate organizational success (IMF, 2018). Khandve (2015) with the sample of 218 respondents from 30 consecutive companies observed that procurement consist of the identification and analysis of obligation and purchasing categories, selection criteria, choice of suppliers, negation of contracts and actions as mediator between two parties and follow up and providing association with suppliers. A survey carried out on handling material is the deliverance of those equipment that gives an adjustment and geographical position (Towey, 2013). Meanwhile, the choice of material handling equipment is crucial to improve the productivity procedures, give the adequate operation of workers, enhancement of production and advancement of the flexibility of the system (Madhavi, 2013). In this regards, effective material handling includes handling, storing and following up construction materials.

Therefore, it was very crucial to adopt adequate way of transporting, loads and unloads of material cannot be carried out in the rain (Latha, 2014). The researcher recommended that storage necessitates to be surrounded, bounded and unpolluted and dry with adequate air circulation with some materials necessitated for loaded on pallets not more than some safety height to avoid humidity (Low, 2014).

In fact stock control involves raw materials, transformed materials, assembly components, usable stores, general repairs and spares materials and finished materials (Donyavi & Flanagan, 2009). Therefore, is necessary for construction materials to be provided as required and with the advancement by appropriate management of stock control. The construction project is producing huge amount of waste and it will stimulate complexity to the construction sector (Cheng, 2014). In conclusion of this points, with plan and design of the material management practices which is very

suitable can be helpful to the reduction of waste of material and improvement of the firm’s return.

2.3. Theoretical framework

The theories discussed in this research are application theory, system theory and theory of lean construction.

2.3.1. Application Theory

Donyavi and Flanagan (2009) analysed the role of this model for customers, planning firms in construction sector. The real effects of the model for construction sector customers and contractors. Using this theory, a construction firm can attain the highest level of expected outcomes and other theories must be seen as crucial phase to the attainment of higher effectiveness given by the entire construction sector.

Nevertheless, several elements were advanced, one is the theory of construction management which establishes a way that can be evaluated and they confirm information necessary to assess key term in the model (Donyavi & Flanagan, 2009). Another elements argued that construction sector may be advanced within studies and surveys in the adequate, organizing teamwork, cooperation and dissemination of information were sufficient. According to scholars, the theory established a situation where CM studies may be adopted and give higher clarification and application than obtainable and stimulate future studies (Bank, 2018).

2.3.2. System theory

This model reiterates that a response is attained through the cooperation of various elements in the working conditions. The claim of the system model is the focus on interdependence of the element of conflicting and cooperating parts. However, material management is an organization model that has been developed through the adoption of system model to management (Bank, 2018).

In this regards, a system refers to a set or association of interdependent components that operate conjointly to realize a

shared objectives (Calkins, 2009). In an attempt to apply the system as a term for material management, the researcher wants to express anything outside to the system itself by interacting with its elements. Therefore, material management become an important and coherent element of system which focuses on particular tasks and which its correlation with other are expressed. The study used system theory because, it increases organisation's adaptability to environmental changes. The organisation is studied as a whole and not through its parts. This enables it to adapt to the needs of the environment. Decisions are made keeping in mind the macro as well as micro environment.

2.3.3. Theory of Lean Construction

Using a CM model among stakeholders stimulate the adoption of new model of lean construction due to its central role in producing material in construction sector. This theory was advanced by Lauri Koskela (2008). Among construction companies, the issues and techniques of lean theory provide solutions to the above approaches. Moreover, the theory affords a look at procedures that are included, relied on model, that encourage assumptions that might be assessed by adoption to construction sector. Most of research were conducted using lean theory meeting several years ago. These studies used it to attempt how to attain the adequacy and success of construction project. The present study used lean construction extends from the objectives of a lean production system, maximize value and minimize waste to specific techniques, and applies them in a new project delivery process. Therefore, lean theory, principles and techniques, taken together, provide the foundation for a new form of project implementation.

2.5. Conceptual Framework

A conceptual framework for this research project emanates from the existing literature review that revealed elements of material management practices. The conceptual framework establishes the link between material management practices and performance of construction project.

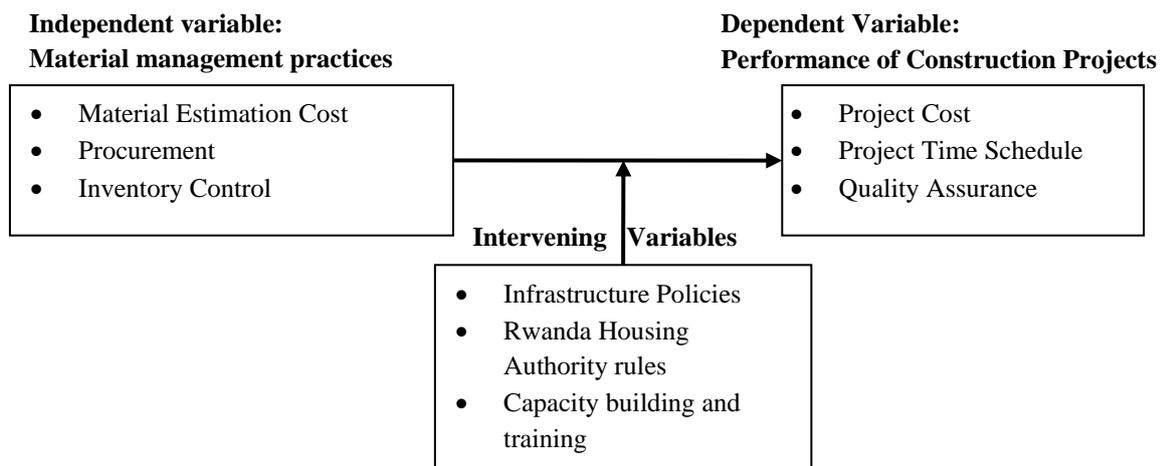


Figure 1: Conceptual Framework
 Source: Researcher (2020)

3. RESEARCH METHODOLOGY

3.1. Research Design

Babbie (2009) refers to research design as a methodical strategy respected during the course of carrying out a study in order to find solution to the growing issue or phenomenon under study. This study used both descriptive and correlational research design. The research adopted qualitative and quantitative approaches. In this regards, a descriptive research was adopted to explain effects of material management practices on performance of construction project Rwanda (Calkins, 2009).

3.2. Target Population and Sampling

It is defined as a group of objects, events, issues, individuals or other elements concerned by the research phenomenon (Blaxter *et al*, 2010). In this regards, the present research is concerned with 243 registered engineers and 35 architects in Rwanda. Population that were included in are people working in Construction industry. These are 75 workers (Director Managers, project managers, Technical manager, Supervisors, Procurement managers, Helpers, and Security staff) carrying out their activities in one organisation located in the aforementioned district (Creswell, 2013) The aforementioned respondents came from five construction sites of Baraka Properties. These are Baraka Villas project located at Kagugu, partitioning Prime Minister Office, University teaching hospital-Masoro, Geneco-Remera and Intech Solutions-Masoro.

Sample size is precise number of respondents considered as representatives of the entire population (Pickard, 2009). A purposive sampling technique has been adopted to permit the architect or of this study to obtain relevant evidences from the entire population (Creswell, 2013). In order to determining a sample size, the author used Yamane (1967) formula. In this case,

$$n = \frac{N}{1 + Ne^2} = \frac{380}{1 + 380 * 0.05^2} \approx 195$$

Where N represents the population size, n=sample size, e=degree of procession (0.05).

Table 1: Calculation of sample size

Categories	Population	Sample Size
Contractors	150	77
Subcontracts	170	87
Engineers	50	26
Regulators	10	5
TOTAL	380	195

Source: Rwanda Housing Authority (2018)

3.3. Data collection instruments

A structured questionnaire was used to gather primary data. It was made of four sections; one section was concerned with sociodemographic characteristics of respondents. Other one gives information concerning specific objectives. The third one is related to the second objectives and fourth with the third specific objectives.

The measurement took into consideration Likert scale where 1=Strongly Agree, 2=Agree, 3=Not Sure, 4=Disagree, 5=Strongly Disagree.

3.4.2 Administration of research instruments

Literature review was given what other have written related to material management (Pickard, 2009). Relevant evidences were gathered from seminar and workshop, journals and internet sources. A questionnaire was both online and hand delivered. Furthermore, structure interviews selected customers and regulators were carried out to obtain evidences in the topic. Therefore, a questionnaire were given physically and via email in order to obtain required information.

4. FINDINGS AND DISCUSSIONS

4.1. Demographic Characteristics of Respondents

Section on sociodemographic characteristics of respondents depicts on general information concerning participants. These include gender, age group, working experience, educational profile and responsivities assumed by respondent.

Table 2: Gender Profile of Respondents

Gender profile	Frequency	Percentage
Male	145	74.5
Female	50	25.5
Total	195	100.0

Source: Primary data (2020)

From Table 2 evidenced that majority of respondents are men. It means that 74.5% were men. Furthermore, only 25.5% are women. This indicated the existence of gender balance in the distribution of respondents henceforth the likelihood of obtaining balanced answers.

Table 3: Age Distribution of Respondents

Age Group	Frequencies	Percentage
26-30 years	73	37.5
31-35 years	73	37.5
36-40 years	24	12.0
41-50 years	25	13.0
Total	195	100.0

Source: Primary Data (2020)

Findings presented in Table 3 indicated 75% of respondents are aged between 26 and 35 years old. In this regards, workers of the company case are youth compared to the age group of others. This implied that workers in the company are in the productive age and energetic to attain planned objectives. This indicates that most of respondents are in their middle age and thus in a right position to attain high level of performance for construction project in Rwanda. Therefore, the age of respondents could not affect the study findings.

Table 4: Respondents' experience in Baraka Properties Ltd

Experience	Frequency	Percent
1-5 years	60	30.8
5-10 years	100	51.3
Above 10 years	35	17.9
Total	195	100.0

Source: Primary Data (2020)

Findings in Table 4 reflect that 51.3% of respondents had a working experience ranging from five to ten years. This was followed by 30.8% of respondents experienced from one to five years working at Baraka Properties Ltd. Furthermore 17.9% of workers from Baraka Properties Ltd had experience of more than ten years.

Table 5: Education of Respondents

Education of respondents	Frequency	Percentage
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In Table 5, it was reflected that most of respondents, 70 (36.9%) attained the high level of secondary schools in construction, 21 (10.8%) respondents hold a diploma while 101 (51.8%) respondents have bachelor's degree. Finally, 3 (1.5%) respondents have master's degree. The researcher contended that employees and employers at Baraka Properties are skilled enough to execute adopted material management practices and achieve effective performance of construction project.

4.2. Presentation of findings

This section presents responses obtained from a questionnaire survey and interview guide. The analysis was performed according to three specific objectives. These are to assess the effects of material estimation cost on performance of construction project in Rwanda; to determine effects of inventory control on the performance of construction project in Rwanda; and to examine the effects of procurement on project performance in Rwanda.

Table 6: Material Estimation Cost on Performance of Construction Project in Rwanda

Level of Agreement	Disagree		Not Sure		Agree		Total		
	N	%	N	%	N	%	N	Mean	Stadev
Feasibility Estimates	39	20.1	37	19.2	118	60.7	195	3.8	1.5
Approximate or conceptual estimates	61	31.3	10	5.1	124	63.6	195	3.4	1.5
Contractors' detailed estimates	25	12.7	20	10.2	150	77.1	195	4.1	1.2
Progress Estimates	59	30.2	13	6.6	123	63.2	195	2.8	1.7
Final Estimates for final payment to contractor	24	12.2	15	7.8	156	80.0	195	3.8	1.6

Source: Primary data (2020)

The project manager or stakeholders begin with the provision of initial material cost estimation known as feasibility study. Results evidenced that 118 (60.7%), a mean of 3.8, standard deviation equal to 1.5 agreed that they used to approximate or conceptual estimates for material estimation costs. In this regards, then the project was felt to be feasible and funds are acquired. After initial estimation, project design must be done with the intention to denote necessities and kind or nature and quality of construction materials. In fact, cost approximation is performed at this level and this is known as conceptual cost estimation. Its intention is to change cost according to the target and size of a construction project need and (Akeel 1989; Barrie and Paulson 1992).

Moreover, 150 (77.1%) respondents, with a mean of 4.1, standard deviation of 1.2 evidenced that at Baraka properties Ltd, they used to detail estimates for contractors' detailed

Secondary schools	70	36.9
Diploma' degree	21	10.8
Bachelor	101	51.8
Master	3	1.5
Total	195	100.0

Source: Primary (2020)

4.2.1. Effects of Material Estimation Cost on Performance of Construction Project in Rwanda

This section presents and analyse information on the effects of material estimation on performance of construction project in Rwanda. In this regards, material cost estimation refers to the examination of the predictable cost of any construction project. The adequacy of this estimation had a clear impact on desired gain of the construction contractor. Therefore, some unforeseen event may be more to the basic estimation to enhance the degree of confidence, this premium is influenced by different factors.

The cost is seen as the pertinent element of project management and may be seen as one of the crucial aspects of any project and the motivating factor of attaining expected outcomes of any project (Azhar et al, 2008). Besides that, Gido and Clements (2003) argued that there are four cost interconnected indicators in material estimation cost analysis that were adopted to analyse material estimation cost of project. These indicators are TBC (Total Budgeted Cost), CBC (Cumulative Budgeted Cost), CAC (Cumulative Actual Cost), and CEV (Cumulative Earned Value). The Table 4.5 presents various material estimation cost that are used at Baraka Properties.

estimates and subcontractors. In this regards the company must plan contract documents as the foundation of cost estimation by contractors with the intention to give a bid. These documents concerned with drawings, specifying, general and specific conditions, agreements, consent and promise (Barrie and Paulson 1992). The aim of this estimation was to assess the actual cost of project (Akeel 1989).Meanwhile, project managers must know, create and implement estimation duties (Samphaongoen 2010).

In addition results show that 123 (63.2%) fo respondents with a mean of 2.8 and standard deviation of 1.7 evidenced that Baraka Properties Ltd estimates the progress cost. Observation from the present study did not contradict evidences from past studies where it has been revealed that constrictor's bid estimation is not the ultimate cost estimation for any construction project. Furthermore, other cost estimation were

done during the construction stage. These include progress estimation which is concerned with contract change order cost estimation to ascertain completion rate and its corresponding payments (Akeel, 1989).

Findings show that 156 (80.0%) with the mean of 3.8, std equal to 1.6 indicated that the Baraka Properties Ltd used to provide the final Estimates for final payment to contractor. In this context it was seen that on project realization, it is pertinent to create the ultimate cost estimation for the entire project implemented. It is adopted to prove amount that are usually realized. It determined the last payment for a contractor at Baraka Properties.

Qualitative data was collected from key informants to deepen the analysis. In This regards, the researcher perform interview with the managing director of Baraka properties. The managing director focused on actual possible strategies used

in construction industry, with client expecting a better service and project that meet their requirements more. The director says “in *estimating cost for our construction projects, we have adopted adequate strategies including the feasibility estimates, approximate or conceptual estimates, contractors’ detailed estimates, the progress estimates and final estimates for final payment to contractor*”. This information did not contradict the findings from ordinal respondents in quantitative data.

Finally, expect conceptual and detailed cost estimation, other were done when project is described and more evidences and facts were available. Moreover, preconstruction cost estimation, other were done when or after construction phase is executed to establish the final project cost. These cost estimations must bring up to date all detailed cost estimations with the focus on real in spite of expected cost (Bley, 1990).

Table 7: Effects of Material Estimation Cost on performance of construction projects

Level of Agreement	Disagree		Not Sure		Agree		Total		
	N	%	N	%	N	%	N	Mean	Stdev
Reduces delays	60	30.6	5	2.8	130	66.6	195	3.6	1.4
Improves quality of services	37	19.2	20.4	10.5	137	70.3	195	2.2	1.4
Ensures steady supply to users/customers	71	36.2	23	11.9	101	51.9	195	3.4	1.5
Ensures price control for users materials	24	12.3	4	2.3	167	85.4	195	3.4	1.5
Helps in controlling stocks	72	36.7	3	1.9	120	61.4	195	3.3	1.7
It helps in controlling prices of the products	24	12.4	7	3.4	168	86.2	195	3.2	1.5

Source: Primary Data (2020)

From Table 7, it was reflected that the mean evidences with highest effects were that: reduces delays 130 (66.6%) with a mean of 3.6 and Standard deviation of 1.4. Therefore, improves quality of services and ensures steady supply to the users/customers was strongly agreed by 137 (70.3%) with a mean of 2.2 and standard deviation of 1.4, ensures steady supply to the users/customers (3.4) and ensures price control for users materials (3.4). The material estimation cost with mean higher than 3.3 meaning the agreement with the statement that material estimation cost can stimulate higher level of success for construction project at Baraka Properties. This tendency has been in accepting with the above statement discovered in the existing literature. Most of people who

participated in the research process reiterated that material estimation cost have a positive significance role in encouraging the success of construction properties at Baraka Properties Ltd, Kigali.

Qualitative results indicated that adequate material estimation has led to high performance for Baraka construction projects. In this regards, chief engineer of the company under this research argues “*owing to effective material estimation costs, we were able to improves quality of services, we have ensured steady supply to the users/customers, price control for users materials and it has helps us in controlling stocks but also to follow up prices of the products*”. This information did not contradict the findings from respondents.

Table 8: Correlation Analysis of the Study variables

		Material E stimation Cost	Performance of construction project
Material Estimation Cost	Pearson Correlation	1	.518**
	Sig.(2-tailed)		.000
	N	195	195
Performance of Construction Project	Pearson Correlation	.518**	1
	Sig.(2-tailed)	.000	
	N	195	195

**Correlation is significant at the 0.05 level (2-tailed).

Source: Primary Data (2020)

Further, information indicated that the coefficient relationship between material estimation cost and performance of construction project at Baraka Properties is 0.518. It implied the significant relationship between material estimation cost

and the success of construction project of Baraka Properties Ltd, Kigali, Rwanda whereby had contributed to the development of aforementioned company.

4.2.2. Effects of inventory control of materials on Performance of Construction Project in Rwanda.

The second research objective determined effects of inventory control on performance of construction project in Rwanda. Inventory control practice is the pertinent occupation of material management and it procedures the central element in an institution (Ramakrishna, 2005). A record system involves all elements of handling a firm’s inventories, buying, and provision, obtaining, controlling, warehousing, storing, transacting and rearranging. Utilizing this meaning,

respondents have been asked to provide responses to reports as it is inferred to Baraka Properties Ltd.

Respondents assessed the degree of participations, apathetic, low participation and very low participation. Relying on interviews with Baraka properties, it was seen that the company uses just in time, lot for lot, butter stock, material requirement planning, and electronic data interchange (EDI), enterprises resource planning (ERP), ABC analysis and intelligence resource planning in Table 9.

Table 9: Inventory Control System –Degree of Involvement at Baraka Properties

Level of Agreement	Disagree		Not Sure		Agree		Total	Mean	Stdev
	N	%	N	%	N	%	N		
Just-In-Time	40	20.6	10	5.1	145	74.3	195	1.65	.87
Lot for Lot	78	40.2	14	7.4	102	52.4	195	2.39	1.11
Buffer Stock	89	45.6	8	4.0	98	50.4	195	2.50	1.29
Material Requirement Planning (MRP)	77	39.4	11	5.8	107	54.8	195	2.16	1.15
Electronic Data Interchange (EDI)	83	42.7	11	5.4	101	51.9	195	2.30	1.21
Enterprise Resource Planning (ERP)	43	22.2	20	10.2	128	65.6	195	1.91	1.09
ABC Analysis	80	41.2	18	9.2	97	49.6	195	2.63	1.38
Intelligence Resource Planning	64	32.6	20	10.2	110	56.2	195	2.06	1.07

Source: Primary (2020)

Information demonstrated a higher involvement of JIT in materials management (1.65) and ERP (1.91). The mean for information provided indicated the existence of higher level of involving MRP (2.26), IRP (2.06). EDI (2.30) and lot for lot (2.39). A level of involving inventory control system on the success of construction project with the mean low than 2.5 meaning that participants highly use inventory control system within the company. The tendency was in favor with the existing literature. In addition, findings indicated that inventory control system scores have been a pertinent technique to help the success of construction projects at Baraka Properties Ltd.

With the intention to enhance the success of construction project, it is very important to endorse inventory control systems. This with high standard deviation have been ABC analysis (1.38), buffer (1.29) and electronic data interchange (1.21). All the above evidences vindicated the far from the average therefore suggesting the existence of low level of participation in these systems at Baraka Properties Ltd.

Furthermore, information with low standard deviation comprises of JIT (0.87), intelligence resource planning (1.09). These responses have been near by the mean, meaning that responses have been not changed, therefore, inventory control are highly involved at Baraka Product Properties.

The ABC analysis refers to comprehensive model of grouping customer or products to be above to obtain most out of time and resources when form is delivering them and this is divided into three components. The first is representing the pertinent products or services that a client has. The second stand for middle of way for clients or services or products and this is at low level of services. The last is relied to many transactions that are important to the firm.

This interview indicates that most inventory control of materials practices used are many. The director of Baraka advances “Just-In-Time, Lot for Lot, Buffer Stock, and Material Requirement Planning (MRP), Electronic Data Interchange (EDI) and the Enterprise Resource Planning (ERP)”. This information did not contradict the findings from ordinal respondents in quantitative data.

Table 10: Effects of Inventory Control on Performance of Construction Projects

Level of Agreement	Disagree		Not Sure		Agree		Total	Mean	Stdev
	N	%	N	%	N	%	N		
Reduction in wastes	59	30.3	8	4.1	128	65.6	195	3.31	1.23
Reduction in production costs	57	29.0	15	7.6	124	63.4	195	3.48	1.48
Increased product quality	43	21.8	20	10.0	133	68.2	195	3.74	1.26
Time deliveries	78	40.2	13	6.7	104	53.1	195	3.69	1.09
Increased profitability	67	34.2	3	1.5	125	64.3	195	3.63	1.22

Reduced stock levels	82	42.1	7	3.4	106	54.5	195	3.35	1.31
Decreased production cycle time	86	44.2	8	4.2	101	51.6	195	3.74	1.12
System flexibility	89	45.4	4	1.8	103	52.8	195	3.74	1.03

Source: Primary Data (2020)

From Table 10, the average of information given with the highest impacts comprises: improved product quality, reduced production cycles times and system flexibility (3.74), timely provision and enhanced the profit and income (3.63). Inventory effects control system with mean higher than 3.5 meaning that participants accept that inventory control systems would stimulate the success of construction project at Baraka Properties. The tendency was concurred with the existing studies. Many respondents accepted that inventory control given that inventory control systems were high significant factor to the success of construction properties at Baraka Properties Ltd, Kigali.

Findings on the mean of adequately three meaning that they were apathetic of saying the influences. The above information include: reducing wastes (3.31), decreased the level of stock, reducing the production costs (3.48). Therefore, it may be indorsed to obstacles encountering material management and to the absence of adequate inventory control systems at Baraka Properties. The highest standard deviation is related to the decrease in production costs (1.48), reduction in stock level (1.31), enhanced production quality

Table 11: Correlation Analysis of the Study Variables

		Inventory System	ControlPerformance of construction project
Inventory Control System	Pearson Correlation	1	.884**
	Sig.(2-tailed)		.000
	N	195	195
Performance of Construction Project	Pearson Correlation	.884**	1
	Sig.(2-tailed)	.000	
	N	195	195

**Correlation is significant at the 0.05 level (2-tailed).

Source: Primary Data (2020)

Therefore, information indicated that coefficient relation between inventory control and performance of construction project at Baraka Properties was 0.884. The evidences implied a positive correlation between inventory control and performance of construction project of Baraka Properties Ltd, Kigali, Rwanda whereby had contributed significantly to the development of construction firms.

4.2.3. Effects of Procurement on Performance of Construction Project in Rwanda

This section provides information related to the effects of procurement on performance of construction project in Rwanda. Procurement consists of appointing contractors and

Table 12: Effects of procurement on performance of construction project at Baraka Properties

Level of Agreement	Disagree		Not Sure		Agree		Total	Mean	Stdev
	N	%	N	%	N	%	N		
Floating of tender as per App	53	27.1	55	28.1	87	44.8	195	2.0	1.2

(1.26) and the decrease of wastes (1.23) meaning that those answers have been far away from meaning while was insignificant. The lowest standard was from system flexibility (1.3) and timely provisions (1.09) meaning that answers have been near to the average of significance due to participants have been in concur with impacts. The analysis indicated that most of participants accepted that inventory control systems would stimulate the decrease of waste (65.6&), timely provision (53.1), reduction of cycles times (51.6), that in turn impacts the success of construction project.

Qualitative results indicated that inventory control has led to high performance for Baraka construction projects. In this regards, chief procurement of Baraka Properties asserts “due to the adoption of inventory control, Baraka was able to reduce wastes, production costs, but also to ameliorate the product quality, delivering materials on due time and date, the productivity was also optimized profitability. Baraka properties Ltd was able to decrease the stock levels and the production cycle time with the system flexibility “.This information did not contradict the findings from respondents.

prepare a contract, but a beginning point in the process of provision (Mead & Gruneberg, 2013). These actions involved in the procurement process are purchasing of equipment, materials, labour and services necessary for construction and execution of a project (Kasim, et al., 2005). The researcher established ideas and point of views on if procurement influences performance of construction project in Rwanda. This section includes identifying, the growing problem in procurement process through various steps and the contribution their can afford to performance of construction project at Baraka Properties Ltd.

Procurement method are selected as indicated in the procurement plan (PP)	6	3.1	55	28.1	134	68.8	195	3.8	1.6
Timely approval of PP and Insurance of GPN	71	36.5	39	19.8	85	43.8	195	4.1	1.2
Timely and appropriate submission of PR	41	20.8	81	41.7	73	37.5	195	3.6	1.3
Adequacy of binding documents	130	66.7	37	18.8	28	14.6	195	3.4	1.5
Advertisement of tender opportunities	91	46.9	63	32.3	41	20.8	195	4.1	1.2
Verification of Successful Bidder's price to the Market	142	72.9	14	7.3	37	19.8	195	2.0	1.2
Procurement record keeping	79	40.6	77	39.6	37	19.8	195	3.8	1.6

Source: Primary data (2020)

People were irritable that most of tenders looking in procurement plan through procurement organs were indicated in sheet and that are actually not executed. People possesses perceptions that the preparation of procurement plan was pertinent in executed tenders. Information in Table 12, demonstrated that 45% of responses accepted that tenders were executed as per year procurement plan. Meanwhile, 27% and 28% of responses did not accept and were neutral on detached as per procurement plan. The disappointment to the procedure of tenders emanate from inadequate procurement system as imaged objectives were not realized.

A survey on the devotion in using procurement approaches demonstrated in yearly procurement plan that 68.8% of responses accept that the approaches were executed per plan. Information agrees that an amelioration of the procurement process as given that per had a suitable considerate on using procurement approaches this, evading pointless adjusted during the execution.

The purpose of general procurement notice was to change people on different procurement change that exist for each on financial year. It stimulate organizations to predict and make themselves. However, the announcement of GPN to the people stimulate competitiveness as many suppliers, contractors or service deliverers have awareness of change while increasing the success of construction project. This research demonstrated that 43.8% of participants from Baraka properties accepted that general procurement notice was accepted timely and issued to the community. However, 56.2% which contains 36.5% that disagree and 19.7% that are not sure on whether the general procurement notices were accepted on time and delivered to the people on due time.

This research evidenced that 37.5% accepted that procurement requirements from incumbent directorates or units were yielded at the right time and well denoted. In addition, 20.8% did not accept and 41.7% were not sure. This great number of

uncertainty and disagreement forth estate on fear on the study question. This evidences that to some extent there is an issue on delivering user requirements to the public procurement units for designing and beginning to tender.

Results show that 20.8% from Baraka Properties Ltd accept that procurement change were suitably adverse in accepted media. Moreover, 79.2 comprises of 46.9% did not accept and 32.3% were uncertain. The origin of a suitable publication was to afford equal chance by qualified suppliers or contractors and fascinate as many figures of economic actors as possible to confirm competition, while achieving value of money. A research conducted to assess the prices of bids for the accepted bidders evidenced that 72.9% of responses did not accept that bid process were verified prior to award to the approved bidders while the remaining 7.3% accepts with the statement.

The role of record keeping was very pertinent in improving clearness, audit and accountable with procurement system. Results shows that only 19.8% of responses from per accepted on system for upholding procurement records and 40.6% and 39.6% of responses have not been accepted and were neutral.

In order to strengthen data analysis, the researcher held interview with the chief in charge of inventory in order to see what and to what extent procurements practices had affects the success of Baraka construction projects. This this context, she confirms "what I can tell you is that adequate inventory control practices we have adopted are for instance floating of tender as per App, adequate procurement methods selected as indicated in the procurement plan (PP), timely approval of PP and Insurance of GPN, timely and appropriate submission of PR, adequate binding of documents, advertisement of tender opportunities, verification of successful bidder's price to the market and procurement record keeping. This information did not contradict the findings from ordinal respondents in quantitative data

Table 13: Effects of procurement on performance of construction projects

Level of Agreement	Disagree		Not Sure		Agree		Total	Mean	Stdev
	N	%	N	%	N	%	N		
Improves quality of materials procured	78	40.2	15	7.9	101	51.9	195	2.9	1.4
Acquiring of right materials at the reasonable prices	60	30.6	14	7.1	121	62.3	195	3.2	1.5

Ensure sufficient and availability of materials	34	17.3	20	10.2	141	72.5	195	3.6	1.4
Recognition of a need for materials.	58	29.9	6	2.9	131	67.2	195	2.2	1.4
Selection of possible source of supplies	69	35.6	20	10.1	106	54.3	195	3.4	1.5
Clear invoice and payments	63	32.3	18	9.1	114	58.6	195	3.3	1.7
Settling favourable tendering prices	56	28.6	15	7.9	124	63.5	195	2.9	1.4

Source: Primary Data (2020)

From Table 13, the average of information given with the highest impact comprised of: Improves quality of materials procured, acquiring of right materials at the reasonable prices (2.9), ensure sufficient and availability of materials (3.2) and recognition of a need for materials (3.6). The effects of procurement with mean higher than 3.3 meaning the participants accept that impacts of procurement would achieve the highest level of success of construction project at Baraka Properties. The tendency was in accepting with the existing and previous studies. Most of responses accepted that procurement systems were a positive element to the success of construction properties at Baraka Properties Ltd, Kigali.

Findings with the mean of about three inevitable have been apathetic of the aforementioned impacts. Those include: selection of possible source of supplies (2.2), clear invoice

and payments (3.4), and settling favourable tendering prices (3.3). It is able to qualify the constraints encountering procurement at Baraka Properties.

Qualitative information on procurement indicated that this material management practice used by Baraka Properties stimulates the success of construction projects undertaken by the company. Furthermore, interview held with the director of procurement unit indicates that he says “*this practice improves quality of materials procured, right materials at the reasonable prices, to be sure with sufficient and availability of materials, recognition of a need for materials, selection of possible source of supplies, clear invoice and payments and leads to settle of favourable tendering prices*”. This information did not contradict the findings from respondents.

Table 14: Correlation Analysis of the Study variables

		Procurement Process	Performance of construction project
Procurement process	Pearson Correlation	1	.874**
	Sig.(2-tailed)		.000
	N	195	195
Performance of Construction Project	Pearson Correlation	.874**	1
	Sig.(2-tailed)	.000	
	N	195	195

**Correlation is significant at the 0.05 level (2-tailed).

Source: Primary Data (2020)

Findings indicated that coefficient correlation between procurement process and performance of construction project at Baraka Properties is 0.874. It means that there is a significant correlation between procurement process and success of construction project of Baraka Properties Ltd, Kigali, Rwanda hence has contributed to the development of company.

5. CONCLUSION AND RECOMMENDATIONS

The first research objective assessed effects of material estimation cost on performance of construction project at Baraka Properties Ltd. The researcher argued that in most of cases, contractors efforts used in managing costs were relied on managing resources. A quantitative analysis was done using coefficient correlation test at 95% indicates that cost reports, cost estimation and budget, and resource management were pertinent elements utilized by contractors to copy with cost on construction projects.

The second research objective determined effects of inventory control system on the success construction project at Baraka Properties Ltd. Findings discovered the existence of a positive relationship between inventory control and performance of construction project. This meant that through inventory control in material management, a company can attain the profit of adequate utilization of employees, affording system flexibility, enhancing production, reducing lead time, reducing wastes, reducing production expense, enhancing product quality were attained.

Scores from the study indicated that inventory control system contribute more to the success of construction project, and like companies should know that inventory control will be strongly accepted in material management actions related to the attaining of higher level of success for construction project. Findings indicated that coefficient correlation between inventory control and performance of construction project was

0.884. It implied the significance link between inventory system and success of construction projects of Baraka PropertiesLtd.

The third objective examined the effects of procurement on performance of construction projects of Baraka Properties Ltd. Procurement in the company did not succeed to preservice the reliability and integrity as the government according wrong contract management, and analysis ca stimulate the postponements or retardation in distributing due financial means provisions to suppliers, cost increase owing to unnecessary change orders. In addition, most of efforts are concerted to people who have tender that are approved rather than considering it in a holistic way of procuring.

Following the findings from this research, the researcher recommended the management of Baraka Properties Ltd, and other construction firms to embrace construction material management in Rwandan construction companies to improve project performance. There is a need of adopting the best management plans. Giving enough and professional figures of labour and adequate materials using detailed cost estimation and using adequate bidding documents.

This study proposes that contractors focus on issues that remarkably impact cost management, involvement of expert in cost estimation renewing staff members through in-service training, refresher course and involvement in workshops of cost management system. Construction sector may consider effects of developing ICT to systematize their cost information management systems. The research proposes the necessity to use inventory control system and information communication technology particularly MRP for attaining higher level of success and ameliorating the ultimate outcomes of site construction. There is a need to afford stuffiest in service training and capacity building for construction management of material in the country in order to have adequate site in construction.

Further studies are needed to establish the efficiency of these mechanism for managing construction projects.

Furthermore, the study had only focused on cost in term of material management. In this regards, a study is needed to see the contribution of material management on project provision in term of quality. Furthermore, a wide sector wit sample may be adequate to generalize information discussed in the research.

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Non-Contact Temperature Reader with Sanitizer Dispenser (NCTRSD)

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DOI: 10.29322/IJSRP.10.09.2020.p10567

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10567>

Abstract- The design and development of a non-contact temperature reader and sanitizer dispenser (NTRSD) system is presented in this study. The system is intended to help prevent the spread of SARS-CoV-2 infection and assist in maintaining and/or improving community health and reducing the negative impact of the infection on the economy and society.

The NTRSD has two subsystems, the temperature reader (TR) and the sanitizer dispenser (SD), which is controlled from a common microcontroller and by design, cannot operate simultaneously. The TR is designed and developed to perform comparably in terms of accuracy with existing and commercially handheld infrared thermometers, display to the user the temperature read, and give visual and aural alerts when the temperature read exceeds the critical body temperature of 38 degrees centigrade. The SD is designed and developed to deliver sanitizer economically, by dispensing only once and only at a needed amount when activated.

The design and development of the system go through the following methodology: System Specification, Control System Design, Hardware Prototype Development, System Test and Data Collection. Based on data obtained from tests made on the built prototype, a reiteration of the above steps is carried out wherein the control system software logic and parameters are adjusted so as to meet the specified system performance. The final test results are acceptable and shows the NTRSD provides a significant contribution on temperature monitoring and on disinfecting the hands

The system utilizes a single Arduino Uno, an MLX90614 temperature sensor, two ultrasonic sensors, an LCD, two pilot lights, a buzzer, a submersible sanitizer pump, an alcohol reservoir, a power supply and a frame to house the system.

Photos of the built and tested prototype, a schematic diagram of the control system, and the flowchart on which the Arduino script is developed are shown. The operation and user-interaction of the actual system is also described. Data are also tabulated and shown along with statistical analysis. The control system program is written such that the temperature read and displayed by the NTRSD very closely matches that of a hand held temperature reader.

The non-contact feature for both the reading of body temperature and the dispensing of sanitizer provided by NTRSD precludes the possible viral transmission from using traditional thermometers, renders handheld IR thermometer operators (HITOs) unnecessary, avoids viral transmission between HITOs

and subjects of their temperature scans, and ensures a clean and uncontaminated sanitizer. The system is envisioned for strategic deployment in public and private areas like public markets, banks, hospitals, schools, offices, residences, and many others.

Index Terms- Arduino Automated System, Covid19, Temperature sensor, Ultrasonic Sensor.

I. INTRODUCTION

The spread of the dreaded and potentially deadly Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-Cov-2) virus has caused a worldwide pandemic, hitting hard and putting at risk the global economy and overwhelming public and private healthcare facilities everywhere. The World Health Organization (WHO) officially named the disease caused by SARS-Cov-2, the 2019 novel coronavirus first identified in Wuhan China, COVID-19[1].

Ethiopia, in the face of a likely acceleration of the virus spread in the country of 110 million people, launched a nationwide door-to-door temperature screening campaign to identify, isolate, and treat those who are infected, or probably are, and prevent or mitigate the spread of the new coronavirus. According to the Ministry of Health, as of August 18, 2020 there are a total 31,336 cases, 18,268 active cases, and 544 deaths. And according to the state-owned Ethiopian News Agency (ENA)[2], many regional states also have begun taking body temperature using thermometer guns.

The WHO issued a bulletin on ways to protect oneself from the virus and to help prevent its spread. These include regular and thorough cleaning of the hands either with soap and water or with alcohol-based products. A regular check of body temperature is also recommended. An elevated temperature is one way to identify a person who may have a COVID-19 infection, although an infected person may not show an elevated temperature or other easily detectable symptoms [3].

Body temperature may be read in a number of ways and using a variety of contact and non-contact devices or systems. Devices that uses mercury to read body temperature fall under traditional methods and require contact with the body. Thermal imaging systems and infrared thermometers, on the other hand, are modern and non-contact temperature assessment devices used to measure a person's temperature.

To provide accurate contact measurement, the testing object and the sensor must be in thermal equilibrium which can lead to longer response times and reading inaccuracies offset by ambient temperature. On the other hand, non-contact measurement using infra-red radiation provides quick and accurate temperature data and without requiring direct touch.

A benefit of thermal imaging systems is that the medical personnel who handles the thermal imaging system is not required to be physically close to the person being evaluated. In fact, the person who handles the thermal imaging system could be in a different area or room, The thermal imaging system may measure surface skin temperature faster than the typical forehead or oral (mouth) thermometers, all of which require the handler a close distance or physical contact with the person being evaluated. Scientific studies show that, when used correctly, thermal imaging systems generally measure surface skin temperature accurately.

The person who handles a thermal imaging system is trained and follow all manufacturer instructions to make sure the system is set up properly and located where it can measure surface skin temperature accurately[4]. The trained personnel also needs to properly prepare the person being evaluated. An inaccurate temperature reading, a false negative, may put other people at risk. The effectiveness of temperature checks depends on the device and conditions under which it is used [5].

From the study of G. Marques and R. Pitarma, a web application is designed to access and monitor the collected data and provide the history of the temperature evolution. The results obtained are promising, representing a significant contribution to infrared temperature monitoring systems base [6]. Another study on Infrared temperature measurement module for the measurement of body temperature, the measurement of the traditional contact thermometer is avoided; it is particularly suitable for measuring body temperature for infants and young children. The measured temperature is displayed through the

LCD module; it has a voice broadcast function that can be used by a man of poor eyesight[7]

In recent years, non-contact measurement methods have been used for numerous applications such as medical, environmental monitoring, home automation, automotive electronics, aerospace and military applications.[8]

II. METHODOLOGY

The development of the Non-Contact Temperature Reader with Sanitizer Dispenser follows a four-part methodology: formulation of the required design based on sensor behavior, operational, manufacturing and economic requirements; design, modeling, and simulation of the micro-controller-based control system; Non-Contact Temperature Reader with Sanitizer Dispenser, hardware prototype development; and system test and data collection.

1. System Requirements

Ethiopia ministry of health encourage every company to check the temperature of every worker leaving and entering the premises to find those who have a fever and be brought to designated quarantine area and to install alcohol dispenser to sanitize workers hands on entering the work premises. The system is designed to help meet these requirements. The control system components are to be selected so that they are the cheapest possible or can be sourced from junk materials. The frame or housing of the Non-Contact Temperature Sensor with Sanitizer Dispenser system should be able to use any locally available materials and could be built in any way, provided that it meets the requirement that is also movable. The code for the micro-controller should be written so that it can easily be modified to suit the actual components used and make the temperature reading and alcohol dispensing system respond

2. Control System Design

The design of the control system is illustrated by way of the NCTRSD schematic diagram

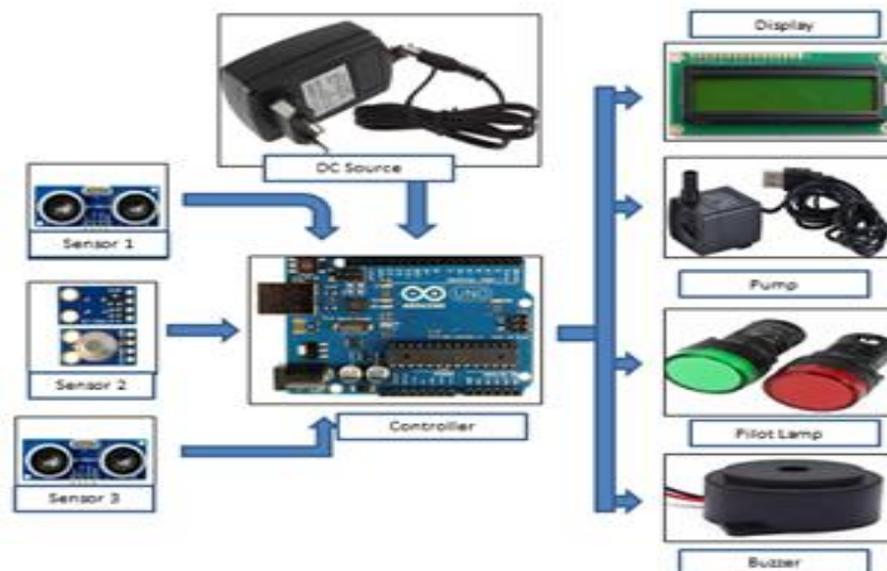


Figure-1: NCTRSD Schematic Diagram

3. Control System Software Modeling and Simulation

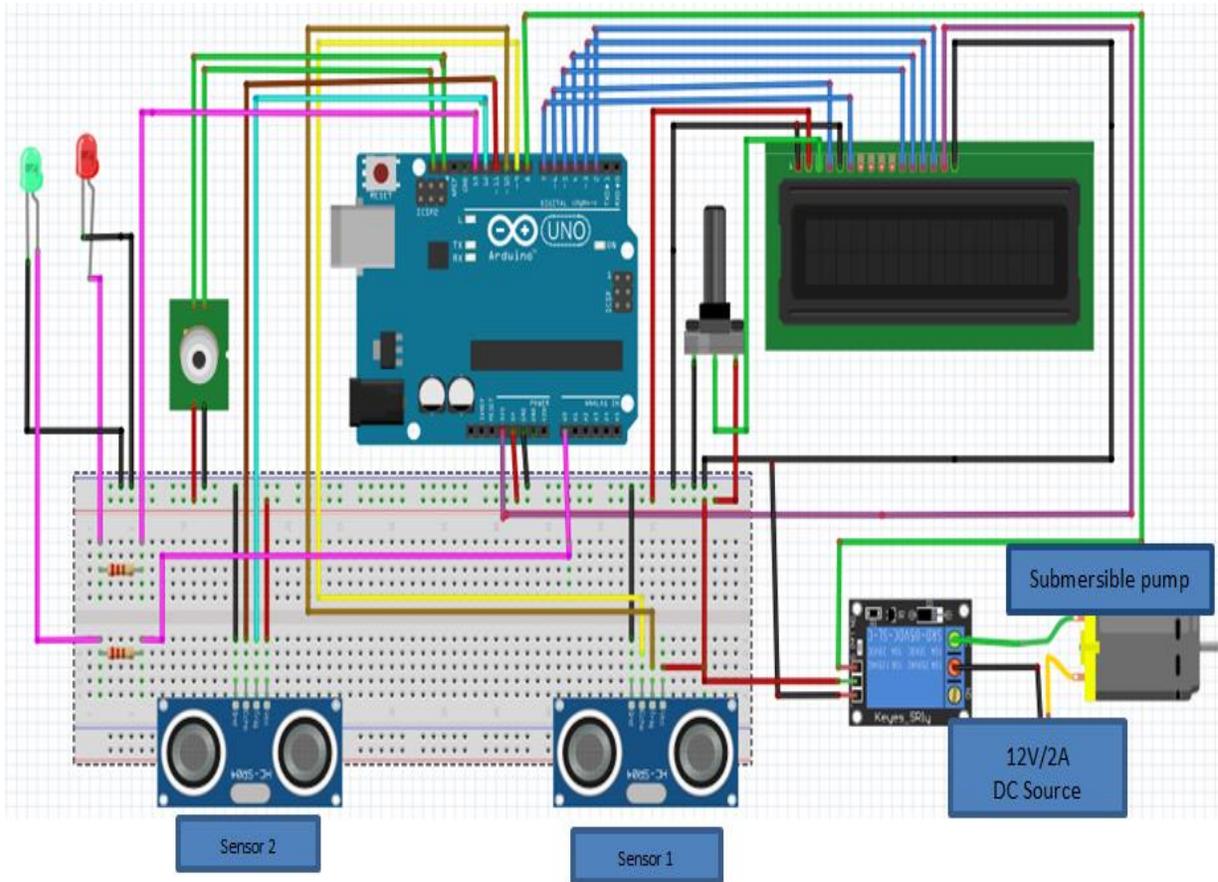


Figure-2: NCTRSD Control System Model

Hardware Model Parts List:

Main Components:

1. Arduino Uno: The Arduino Uno is microcontroller board based on the Microchip ATmega328P microcontroller that controls the Input (ultrasonic and temperature Sensor) and output (Motor Pump and LCD)
2. Temperature Sensor (MLX90614): The MLX90614 is an infrared thermometer for non-contact temperature measurements. Both the IR sensitive thermopile detector chip and the signal conditioning ASIC are integrated in the same TO-39 can. Integrated into the MLX90614 are a low noise amplifier, 17-bit ADC and powerful DSP unit thus achieving high accuracy and resolution of the thermometer. A non- contact infrared sensor thermometer is useful for measuring temperature under circumstance where thermocouple or other probe type sensors cannot be used or do not produce accurate data for a variety of reasons[8].
3. Ultrasonic Sensor: is a device that can measure the distance to an object by using sound waves. It measure distance by sending out a sound wave at a specific frequency and listening for that sound wave to bounce back.
4. Submersible Motor Pump: It is electric pump that is fully submerged in alcohol and it does not require a lot of energy to dispense alcohol
5. Liquid Crystal Display (LCD): is an electronic display module that uses liquid crystal to produce a visible image and in this paper it display the Temperature of the user.

Flowchart

The Arduino Uno script is based on the flowchart shown in figure 4.

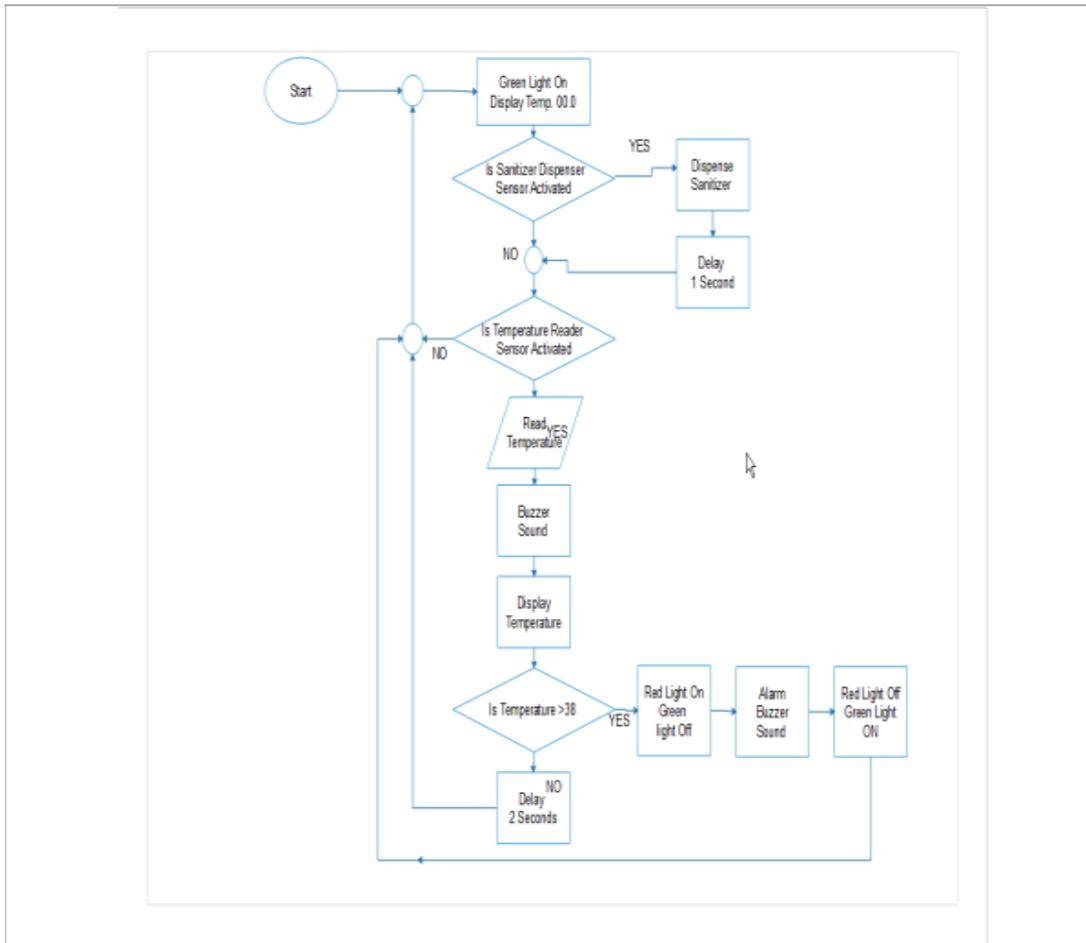


Figure- 4: Process Flowchart

C. NCTRSD Hardware Prototype Development

The development of the Non-Contact Temperature Reader with Sanitizer Dispenser hardware prototype is as shown in Fig. 5 with its components.



Figure-5: Control System Prototype Implementation

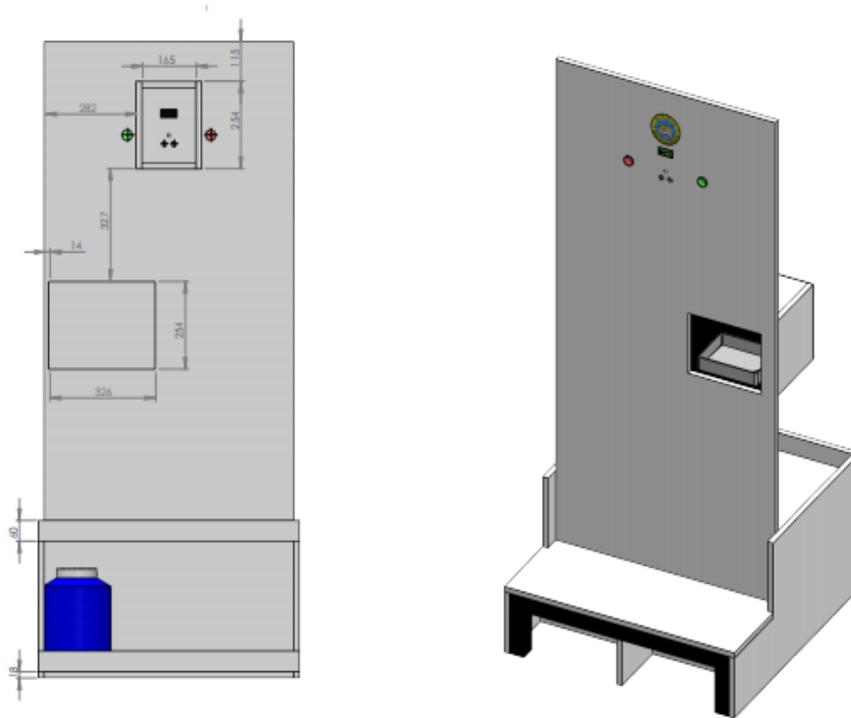


Figure-6a: NCTRSD Prototype

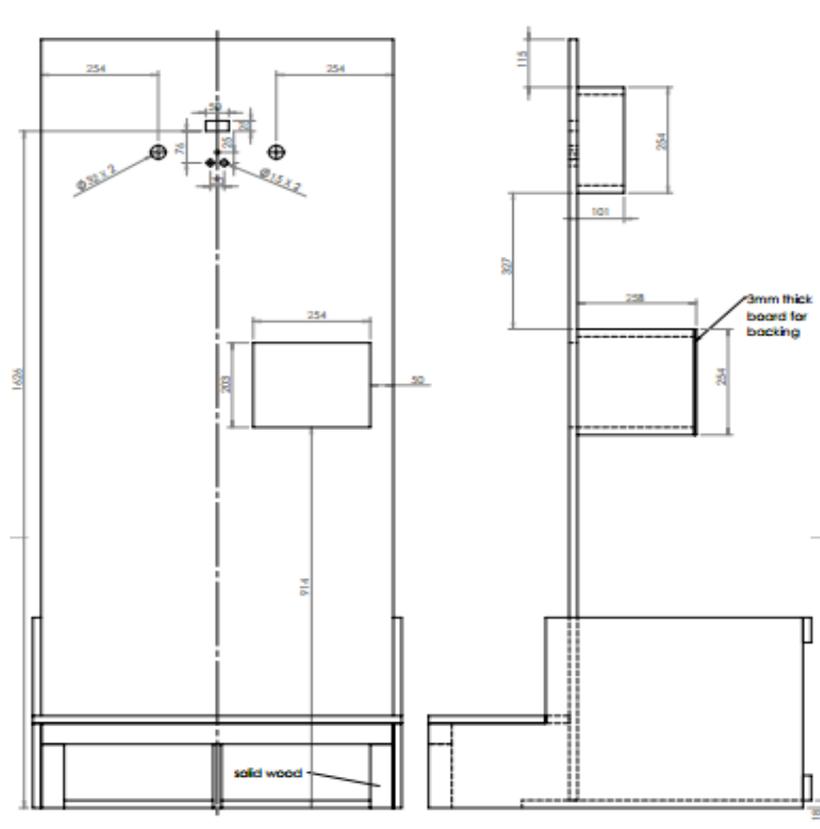


Figure- 6b: NCTRSD Frame Dimension

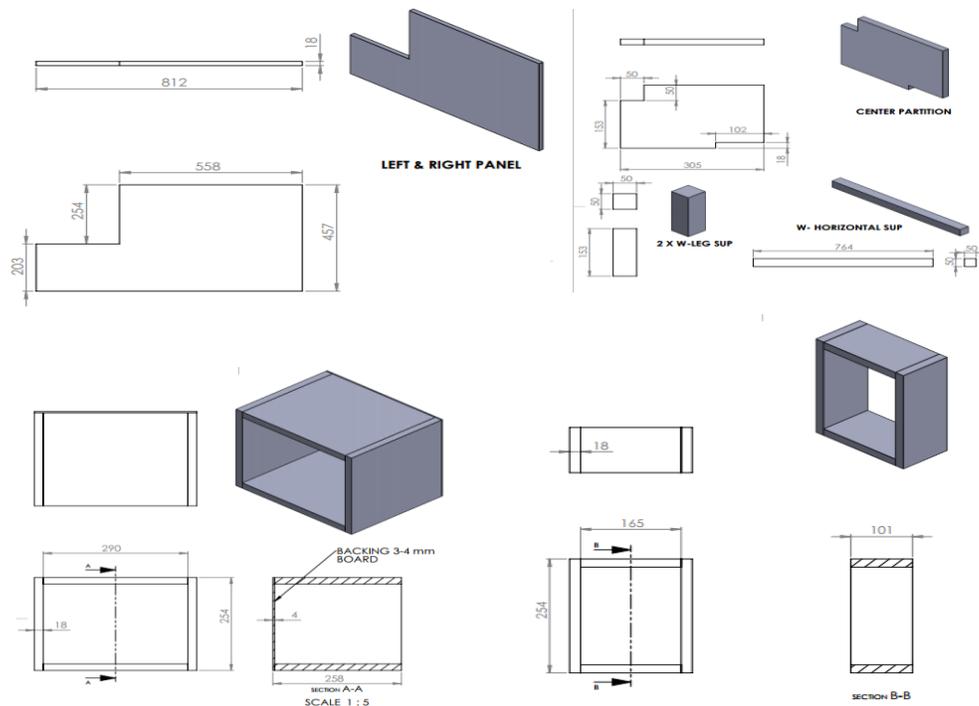


Figure-6C: NCTRSD Frame Parts Dimensions

E. System Tests and Data Collection

Throughout the number of iterations undertaken in the development of the NCTRSD, from hardware prototype, a series of similar tests are conducted. There are 7 test cases on the system as follows.

- User Approach Sensor 1- The User will put his/her hand in the hand sanitizer box and the sensor 1 will be activated than it will dispensed after that he can go to temperature sensor.
- User Approach Sensor 2-The user approached the sensor 2 within a distance of 20 cm, than the sensor 2 will read the temperature and the LCD will display the reading.
- User Approach sensor 1 and do again in sensor 1(Sensor 1 dispensing)- The user approach sensor 1 and it dispense while the user hand not removed the machine will not dispense but if the user hand he remove in the dispensing machine and return the machine will dispense.
- User Approach sensor 2 and do again in sensor 2(Sensor 2 Reading)- The user approach sensor 2 , the reading will be displayed and if the user move away in at least one(1) meter from sensor 2 and he return in same sensor than the reading will be display again.
- User Approaches Sensor 1 and another User Approaches Sensor 2 at the same time – Once a sensor is activated the other is waiting.
- User Approaches Sensor 2 and another User Approaches Section 1 at same time- Once a sensor is activated the other is waiting.

III. RESULTS AND DISCUSSION

Tests Conducted and Results

The tests conducted and the results for 1 Control System Hardware Model Tests and 2 NCTRSD Prototype Tests are all similar. And also test conducted in different time in a day to determine the system reliability in different environment and compare to the result obtain in manufactured handheld temperature reader. The results are summarized as shown in Table 1.

Table-I: Summary of System Responses under the Different Test Cases

Test Case	System Description	Control System Hardware Model	NCTRSD Prototype
1	User Approach Sensor 1	Correct	Correct
2	User Approach Sensor 2	Correct	Correct
3	User Approach sensor 1 and do again in sensor 1(Sensor 1 dispensing)	Correct	Correct

4	User Approach sensor 2 and do again in sensor 2(Sensor 2 Reading)	Correct	Correct
5	User Approaches Sensor 1 and another User Approaches Sensor 2 at the same time	Correct	Correct
6	User Approaches Sensor 2 and another User Approaches Section 1 at same time	Correct	Correct

Table-2: Summary of System Responses under different time (Environment)

	TIME[L]	TEMP[X]	HH[Y]	NCTRSD[Y]
1	7:00	1	36.5	36.4
2	7:05	2	36	36.1
3	7:08	3	35.8	35.6
4	7:15	4	36.1	36.1
5	7:30	5	36	36
6	7:31	6	36.3	36.2
7	8:00	7	36.2	36.1
8	8:05	8	36.5	36.6
9	8:07	9	36	36
10	12:10	10	36.2	36.1
11	12:30	11	36.6	36.5
12	1:30	12	36.8	36.6
13	1:35	13	36.3	36.3
14	1:38	14	36.2	36.2
15	1:40	15	36.5	36.5
16	1:50	16	36.6	36.5
17	1:55	17	36.2	36.3
18	4:30	18	36	35.8
19	4:50	19	36.8	36.8
20	5:10	20	36.2	36.1

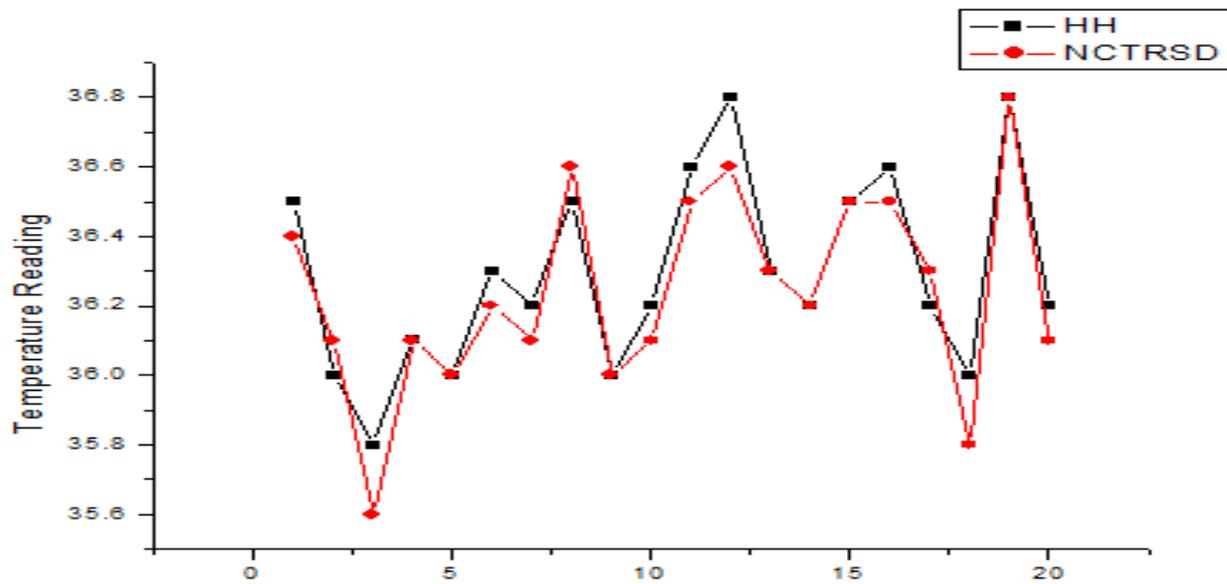
Time (L) - Respondent Testing Time

TEMP(x) - X-axis for Number of Respondents on data collection.

HH(y) - Y Axis which is the measurement of the user in Hand Held Temperature Reader

NCTRSD- is the prototype system being test .

From the graph 1 as shown below it's clearly shows that the reading in handheld device is almost similar in the NCTSD Prototype.



Graph 1: Handheld Vs NCTRSD

Table 3: Analysis from the reading of two different devices to twenty despondent .

Data from Worksheet Data1 Col(HH) => Col(NCTRSD)											
	Row(X)	Mean(Y)	sd(yErz)	se(yErz)	Min(Y)	Max(Y)	Range(Y)	Sum(Y)	N		
1	1	36.45	0.07071	0.05	36.4	36.5	0.1	72.9	2		
2	2	36.05	0.07071	0.05	36	36.1	0.1	72.1	2		
3	3	35.7	0.14142	0.1	35.6	35.8	0.2	71.4	2		
4	4	36.1	0	0	36.1	36.1	0	72.2	2		
5	5	36	0	0	36	36	0	72	2		
6	6	36.25	0.07071	0.05	36.2	36.3	0.1	72.5	2		
7	7	36.15	0.07071	0.05	36.1	36.2	0.1	72.3	2		
8	8	36.55	0.07071	0.05	36.5	36.6	0.1	73.1	2		
9	9	36	0	0	36	36	0	72	2		
10	10	36.15	0.07071	0.05	36.1	36.2	0.1	72.3	2		
11	11	36.55	0.07071	0.05	36.5	36.6	0.1	73.1	2		
12	12	36.7	0.14142	0.1	36.6	36.8	0.2	73.4	2		
13	13	36.3	0	0	36.3	36.3	0	72.6	2		
14	14	36.2	0	0	36.2	36.2	0	72.4	2		
15	15	36.5	0	0	36.5	36.5	0	73	2		
16	16	36.55	0.07071	0.05	36.5	36.6	0.1	73.1	2		
17	17	36.25	0.07071	0.05	36.2	36.3	0.1	72.5	2		
18	18	35.9	0.14142	0.1	35.8	36	0.2	71.8	2		
19	19	36.8	0	0	36.8	36.8	0	73.6	2		
20	20	36.15	0.07071	0.05	36.1	36.2	0.1	72.3	2		

Based on the table 3, The standard error is 0.05 which means that the system is accurate and acceptable

IV. CONCLUSION

In this paper, the Non-Contact Temperature and Sanitizer Dispenser Devices is best way to avoid the used of traditional contact thermometer and Handheld device for preventing the spread of SARS-Cov-2 infections, The measured temperature is displayed through the LCD and with Pilot Lamp indicator if the reading is normal or above 38 degrees centigrade. The system shows that the temperature reading results is accurate based on the data gathered. The system help the frontlines on checking the temperature and dispensing alcohol to workers in any company. The advancement of the Sanitizer dispenser is that virus will be eliminated easily since no body will touch the pump and this system is will Dispense only few amount of alcohol per motion activation and its highly efficient in which waste will be minimal.

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10567>

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Financial Control and Organizational Performance: A Case of Rwanda Broadcasting Agency (RBA)

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Abstract: Many organizations in Rwanda face financial control related issues due to inappropriate use of accounting principles, inadequate funding, poor departmental administration and management of public funds, inefficient and inadequate internal control systems that led to the shortfalls in financial control and organizational performance. Hence, research aims at assessing the importance of Financial Control on organizational performance of RBA in the last three years. The researcher theoretically and empirically reviewed the past studies in relation to Financial Control and organizational performance, to the variables of the study including Financial Control which is measured in terms of budgetary control, Financial reporting, Cost control whereas measures like financial performance, business performance and organizational effectiveness measures organizational performance. This study was descriptive survey and a target population of three hundred (300) employees of RBA in which a sample size of 171 respondents was determined using Yamane (1967) formula and purposive sampling technique was used to select those respondents from the whole target population. Later, analysis of data starts with editing and collecting of data and data gathered was analyzed using descriptive and inferential statistics. Specifically, the frequencies, percentages, correlation and regression analysis which was used to explore the variables under study, qualitative data arising out of perceptions, opinions and suggestion was expressed in percentages as per the categories of respondents against their variables and analyzed using Statistical Package for Social Sciences (SPSS version 21). Thus, the findings of this study between financial control and organizational performance has also shown that there is a significant relationship between budget control and financial reporting ($p=.744$ and $\text{sig}=.000$), between budget control and cost control ($p=.583$ and $\text{sig}=.000$), between financial reporting and cost control ($p=.737$ and $\text{sig}=.000$), between return on asset and return on capital ($p=.801$ and $\text{sig}=.000$), return on asset and net profit margin ($p=.819$ and $\text{sig}=.000$), return on capital employed and net profit margin ($p=.848$ and $\text{sig}=.000$). Thus, implying that to improve organizational performance in RBA there should be improvement of financial control through ensuring budget control, financial reporting and cost control. Basing on the findings, the researcher recommended to the Public Institutions that there are should be regular budget controls to enhance organizational performance; to the employees of RBA that financial report should be done regularly and on time to ensure organizational performance; to the managers and supervisors in RBA, to ensure that the departmental budgets meet departmental income and expenses in order to ensure organizational performance in RBA.

Key Words: Financial Control, Organizational Performance, Budgetary control, Financial reporting, Cost control

1. Introduction

Numerous empirical studies have demonstrated financial control as the backbone of organizational performance in the business world (Morley, et al., 2016). Thus, it illustrated how organizations that develop effective financial control processes are more likely to both have positive work environments, be more effective in achieving their objectives and gain performance through effective use of budgetary control, cost control and financial reporting to enhance both financial control and organizational performance.

In this view, financial control contributes to increased budgetary controls for employees and better bottom line benefits for the organization for the sake of enhancing organizational performance. Likewise, Zwijze and de Jong (2005) highlighted that the importance of financial control for the organizational performance includes organizational effectiveness and business performance that enhances satisfaction and performance of employees. In addition, research has shown how dysfunctional or destructive management of financial control can be calamitous for business organizations (Schyns and Schilling, 2013; and Tourish, 2013).

Financial Control is a process of managing and overseeing the preparation of financial statements and ensuring that insightful data from the reports are well reported, it further deals with the authenticity of financial reports, regulatory compliance and analysis of

financial data. It enables us to do important things: to grow, to learn, to be aware of ourselves and to adjust to our environment (Ashalatha, 2008).

Most of developing countries in Africa including Rwanda have turned their attention towards developing financial control activities to enhance organizational performance. Financial control is becoming very crucial in developing organizational performance especially in RBA as an indicator and as a way towards development. In this context, financial control as a source of information organizes other resources and the effectiveness of information has to be the factor that has contributed to organizational performance.

Financial control process is meant to build rapport which is about establishing a level of familiarity and trust with clients, co-workers, stakeholders and even your competitors (Amine, 2017). It's a process that relies on effective financial control skills to help create a bond that fosters a health, trusting and profitable business relationship. The study of Yuchtman and Seashore (2007), demonstrated that sixty percent of staff feels that the organization lacks transparency and instructions are not clearly and timely communicated and it resulted in low self-esteem and has reduced the level of performance and commitment of staff in achieving their organizational goals and objectives. The low levels of performance affected the quality of the work in that employees did not compile client quotations with the relevant information and accuracy of calculations lack validation. Analysis and statistics showed that one out of every three quotes is incorrectly compiled (Management Report, 2018).

Currently, ministries, boards, Authorities and Agencies in Rwanda were being called by public account committee to give justification on the control of finances and financial statement reported. Though, follow-ups were made but RBA still kept facing the problems of financial control as a public institution that still have inappropriate use of accounting principles, inadequate funding, poor departmental administration and management of public funds, ineffective and inadequate internal control systems in place which has led to the shortfalls in financial control and organizational performance of the whole agency (RBA, 2018). Hence, the need for analyze how financial control is important in promoting organizational performance at RBA in the last five years.

2. Statement of the Problem

Financial Control is the backbone of effective organizational performance in terms of both financial and business performance because it plays a very important role in attainment of the organizational goals and objectives (Kagwiria, 2008). An efficient Financial Control system and efficient financial information flow in an organization is a prerequisite to making them relevant and relate well with the society. Unfortunately, there seem to be lack of coordinated and efficient Financial Control policy in many organizations and such organizations with poor Financial Control faces challenges such staff morale related issues, lack of transparency and reduced levels of customer service (Management Report, 2018).

Recently, Public account committee called a number of public institutions to give accounts on how their finances were used, spent and managed in order to ensure accountability of financial control to enhance performance of public institutions in Rwanda (Samuel, 2018). It has been observed that institutions like REG, RRA, Ministry of Infrastructure to mention but few have failed to justify their unfinished project and how the money provided for those project were spent and managed (OAG, 2018).

The internal reports have shown that RBA have encountered issues in handling financial control of the departments due to inappropriate use of accounting principles, inadequate funding, poor departmental administration and management of public funds, ineffective and inadequate internal control systems in place which has led to the shortfalls in financial control and organizational performance of the whole agency (RBA, 2018). The clients and service seekers have been complaining of serious delays in the processing of their announcements though they have paid on time. It is against this regard the researcher wants to analyze how Financial Control is important in promoting organizational Performance at RBA in the last five years.

3. Objectives of the Study

3.1. General Objective

The general objective of the study is to assess the role of Financial Control on promoting organizational Performance taking RBA as a case study.

3.2. Specific objective

- (i) To examine the effect of budgetary control on organizational performance in RBA;
- (ii) To assess the impact of financial reporting on organizational performance in RBA;
- (iii) To find out the relationship between Financial Control and organizational effectiveness in RBA.

4. Literature Review

4.1. Empirical review

Manufacturing firms are aware of the financial control system (Ajonbadi, et al., 2014). In a study, Omboga et al., (2016) revealed that financial control has a strong positive correlation with industry's positive performance because ($p=.822$ and $sig=.000$) whereas effective cash control, cash processing and budgeting with industry performance has a positive significant relationship ($p=.795$, $sig=$

.000; $p=.857$ and $sig=.000$; and $p=.721$ and $sig=.002$) respectively. They recommended the examination of the effect of human behavior on the application of financial control mechanisms.

Harley and Emery, (2016) and Oyebanji, (2018) concluded that the approach of organizing the system of financial control influences not only the safety of material and financial resources but all of its financial and economic activities. A properly organized system of financial control allows not only for early detection of flaws but to take timely action to address them. Hence, the significant positive relationship found between financial control and economic activities as represented by .775 of Pearson correlation and .000 of significance value at 0.01 level of significance.

Simiyu et al., (2018) and Ibrahim et al. (2018) conducted on studies of risk and financial planning practices and have established that sound financial management practices and control are components that have significant yet moderating relationship with the performances of the firm ($p=.541$ and $sig=.010$). While Maiga et al., (2018) and Mutya, (2018) concluded from the study of the interaction effect of cost control system and information technology integration that manufacturing plant could obtain the utmost financial performance and rewards from investments in activity-based cost control systems in conjunction with information technology integration.

Baseweti and Muturi, (2018) in the study ‘effect of risk mitigation on the financial performance of manufacturing firms’ discovered there was a significant strong positive relationship between changes in production, economic risk mitigation and financial performance ($p=.732$ and $sig=.005$; $p=.711$ and $sig=.006$) respectively. They recommended that companies should practice comprehensive risk mitigation planning to counter any likely event that might cause a business breakdown.

Agbaje and Funson, (2018) also concluded that pragmatic policy options should be formulated in the manufacturing industry to effectively manage and prevent firm from recording fictitious revenue in order enhance performance, this is because there was a significant negative relationship between financial reporting fraud and profitability. Also, fraud prevention in financial statements should be sufficiently inculcated into the internal control system for the effective running of the manufacturing industries in Nigeria.

Ajonibadi et al., (2014) stated that financial control in a large organization is often the responsibility of various groups like the audit committee, management committee, financial controller etc. however, this is often not the case in smaller organizations where control is the responsibility of a single manager (Bett & Memba, 2048). McCrindell, (2015) concluded that the purpose of any financial management and control framework is to facilitate and set boundary lines for the planning, use and accounting of resources which impacted on the profitability.

4.2. Conceptual framework

Robson (2011) referred conceptual framework to a visual or written product, one that explains, either graphically or in narrative form, the main things to be studied as the key factors, concepts, or variables and the presumed relationships among the independent, dependent and intervening variables.

This conceptual framework describes the relationship between the variables of the study through graphic design demonstrating Financial Control as an independent variable, organizational performance as a dependent variable and other variables known as intervening variables that can falsify the information in dependent variable when are not well controlled which are internal control systems and financial monitoring.

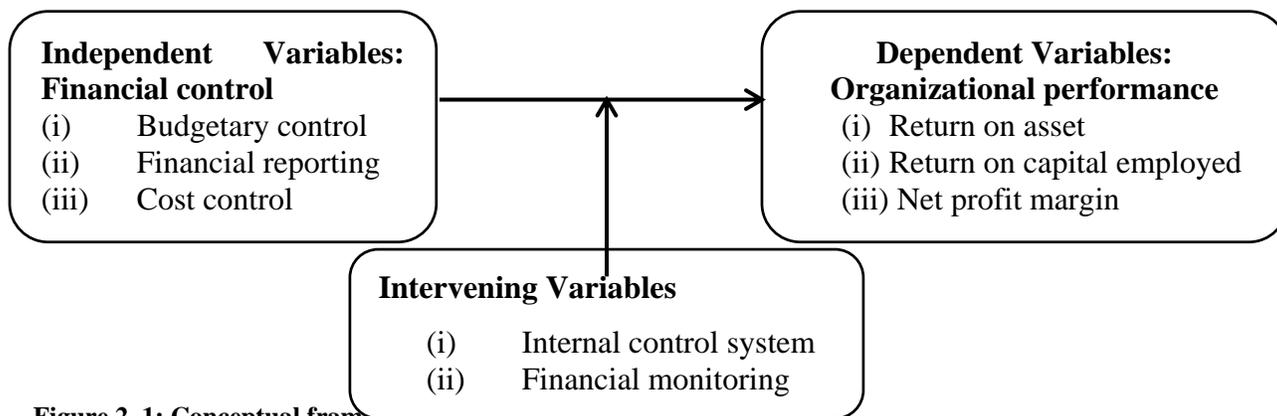


Figure 2. 1: Conceptual framework

Source: Researcher, 2019

This figure 2.1 above conceptual framework explains that there is relationship between the variables of this study as the above graphic design demonstrates that Financial Control as an independent variable is measured in terms of budget control, financial reporting and cost control whereas the variable like organizational performance is a dependent variable and it is measured in terms of return on asset, return on capital employed and net margin profit and other factors such internal control systems and financial monitoring known as intervening variables that can affect the results in organizational performance when are not well controlled.

Budget control as a predictor of financial control has a relationship with organizational performance in terms of influencing return on asset, return on capital employed and net profit margin. Financial reporting as a predictor of financial control affects organizational performance in terms of return on asset, return on capital employed and net profit margin. Whereas cost control does affect organizational performance in terms of return on asset, return on capital employed and net profit margin.

4. Research Methodology

This study adopted descriptive survey research design which is preferred because this study aims at exploring and explaining the existing status of Financial Control and its effects on organizational performance of RBA. Hence, descriptive survey determines and reports the way independent variable and dependent variable are interrelated according to views and perceptions of respondents (Gay, 2001).

A research design refers to a plan, blue print or guide for data collection and interpretation, a set of rules that enable the investigator to conceptualize and observe the problem under study (Adams and Scheveneldt, 2005). Grinnell and Iams (2009) referred a research design to a careful systematic study or investigation undertaken to establish same facts and principles; it can also be defined as the totality of plans we use to aid as in answering research questions. In this study, descriptive survey design was employed. Fraenkel and Wallen (2013) describe a descriptive study as a collection and analysis of data that allows one to describe the current status of the subjects in the study. It enables one to describe the characteristics of a population, understand the given characteristics of that population and also offers ideas for further research

Target population is a group or category of human being, animals and objects which have one or more characteristics in common and have been selected as a focus of the study, Mulusa (2008). This study was carried out in Gasabo District and it targeted three hundred (300) employees of RBA specifically from the RBA headquarter. The sixty employees consist of sixty (171) managers and supervisors who are in management on different levels and two hundred forty (240) subordinate staff who are not in management

Peter (2004) defines a sample as a representative, part of a population. Thus, the sample size was determined using the formula of Yamane (1967) as follows:

$$n = \frac{N}{1 + Ne^2}$$
$$n = \frac{300}{1 + 300(0.05)^2}$$
$$n = 171$$

N is target population, n is sample size or respondents, while e (0.05) is margin error at 95% level of confidence

Purposive sampling technique was used to select 171 numbers of respondents who are involved in this study. According to Wallen (2004), purposive sampling technique allows the researcher to select the number of respondents basing on a purposive reason and the number of respondents is involving in the study due to a reason. Thus it gave each respondent an equal chance of participating in the study therefore ensuring that the sample is representative.

The main research instrument for this study was a self-administered questionnaire and interview guide. This is because less time is required to respond. It is also less expensive and it is one of the best tools that are free from the interviewer bias. Respondents have more time to give well thought out responses (Kothari, 2004).

Analysis of data starts with editing and inspecting of data pieces in order to identify spelling mistakes and any wrongly answered or responded items. The data gathered was analyzed using descriptive and inferential statistics. Specifically, the frequencies, percentages, correlation and regression analysis was used to explore the variables under study. Qualitative data arising out of perceptions, opinions and suggestion was expressed in percentages as per the categories of respondents against their variables and analyzed using Statistical Package for Social Sciences (SPSS).

5. Research key findings

5.1. Budgetary control on organizational performance in RBA for the last five years

The respondents were requested to indicate their responses on the statement regarding budgetary control involvement in organizational performance that is measured using 1-4 Likert scale (1-great extent, 2-moderate extent, 3- small extent, 4- not sure).

Table 5.1: Budgetary control on organizational performance in RBA for the last five years

Statement regarding budgetary control	4	3	2	1
Preparation of budget	1(0.6%)	1(0.6%)	5(2.9%)	164(95.9%)
Recording actual achievements	1(0.6%)	2(1.2%)	7(4.2%)	161(94.0%)
Getting the difference between actual and budgeted performance	1(0.6%)	1(0.6%)	4(2.4%)	165(96.4%)
Controlling the costs	1(0.6%)	2(1.2%)	7(4.2%)	161(94.0%)
Planning for further actions	1(0.6%)	1(0.6%)	4(2.4%)	165(96.4)

Source: Primary Data (2019)

The results in Table 5.1 indicates that 164 (95.9%) of total respondents have agreed to a very great extent that budgetary control involves preparation of budget in order to affect organizational performance, 161 (94.0%) of total respondents have agreed to a very great extent that budgetary control to influence organizational performance it has to involve recording of actual achievements, 165 (96.4%) have agreed to a very great extent that budgetary control involves getting the difference between actual and budgeted performance to affect the organizational performance, 161 (94.0%) have agreed to a very great extent that budgetary control involves getting controlling the costs the difference between actual and budgeted performance to affect the organizational performance, 165 (96.4%) have agreed to a very great extent that budgetary control involves planning for further actions to affect the organizational performance. Thus, it implies that budgetary control has an effect on organizational performance in RBA for the last five years.

5.2. Financial report on organizational performance in RBA for the last five years

The respondents were requested to indicate their responses on the statement regarding financial report involvement in organizational performance that is measured using 1-4 Likert scale (1-great extent, 2-moderate extent, 3- small extent, 4- not sure).

Table 5.2: Financial report on organizational performance in RBA for the last five years

Statements	4	3	2	1
Financial reporting influences organizational performance	1(0.6%)	1(0.6%)	2(1.2%)	167(97.6%)
Cash flow realization influences organizational performance	1(0.6%)	2(1.2%)	5(3.0%)	163(95.3%)
Changes in equity influences organizational performance	1(0.6%)	1(0.6%)	2(1.2%)	167(97.6%)

Source: Primary Data (2019)

The results in Table 5.2 indicates that 167 (97.6%) of total respondents have agreed to a very great extent that financial position influence organizational performance, 163 (95.3%) of total respondents have agreed to a very great extent that cash flow realization influence organizational performance, 167 (97.6%) of total respondents have agreed to a very great extent that changes in equity influences organizational performance. Hence, this implies that financial report has an impact on organizational performance in RBA for the last five years.

5.3. Financial Control and organizational performance in RBA for last five years

The respondents were requested to indicate their responses on the statement regarding financial control involvement in organizational performance that is measured using 1-5 Likert scale (1- strongly agree, 2- agree, 3- disagree, 4- strongly disagree, 5-not sure).

Table 5.3: Financial Control and organizational performance in RBA for last five years

Statements	1	2	3	4	5
Managers hold budget conferences regularly to review performance	1(0.6%)	1(0.6%)	0(0.0)	2(1.2%)	167(97.6%)
Managers do meetings regularly to assess performance of the organization	1(0.6%)	2(1.2%)	0(0.0)	4(2.4%)	164(95.8%)
Budget policies do monitor budget spending in our organization	1(0.6%)	1(0.6%)	1(0.6%)	1(0.6%)	167(97.6%)
Departmental heads do control budget activities regularly	1(0.6%)	2(1.2%)	0(0.0)	4(2.4%)	164(95.8%)
The executive committee do review costs of activities and functions constantly	1(0.6%)	1(0.6%)	1(0.6%)	1(0.6%)	167(97.6%)
Evaluation reports are prepared frequently	1(0.6%)	2(1.2%)	0(0.0)	4(2.4%)	164(95.8%)

Source: Primary Data (2019)

The results in Table 5.3 indicates that 167 (97.6%) of total respondents strongly agreed that managers hold budget conference regularly to review performance, 164 (95.8%) of total respondents have strongly agreed that managers do meeting regularly to assess the performance of the organization, 167 (97.6%) of total respondents have strongly agreed that budget policies do monitor budget

spending in our organization, 164 (95.8%) of total respondents have strongly agreed that departmental heads do control budget activities regularly, 167 (97.6%) of total respondents have strongly agreed that executive committee do review cost of activities and functions constantly, 164 (95.8%) of total respondents have strongly agreed that evaluation reports are prepared frequently. Thus, implies that financial control has an effect of organizational performance in RBA for the last five years.

Table 4.4: Correlation Analysis between financial control and organizational performance in RBA

		Return on asset	Return on capital employed	Net profit margin	Budget control	Financial reporting	Cost control
Return on asset	Pearson Correlation	1	.801**	.819**	.813**	.762**	.775**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	171	171	171	171	171	171
Return on capital employed	Pearson Correlation	.801**	1	.848**	.674**	.824**	.894**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	171	171	171	171	171	171
Net profit margin	Pearson Correlation	.819**	.848**	1	.687**	.935**	.834**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	171	171	171	171	171	171
Budget control	Pearson Correlation	.813**	.674**	.687**	1	.744**	.583**
	Sig. (2-tailed)	.000	.000	.000		.000	.000
	N	171	171	171	171	171	171
Financial reporting	Pearson Correlation	.762**	.824**	.935**	.744**	1	.737**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	171	171	171	171	171	171
Cost control	Pearson Correlation	.775**	.894**	.834**	.583**	.737**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	171	171	171	171	171	171

** . Correlation is significant at the 0.01 level (2-tailed).

Source: Primary Data, 2019

The findings in Table 4.4 indicates that there is a relationship between budget control and financial reporting (p=.744 and sig=.000), between budget control and cost control (p=.583 and sig=.000), between financial reporting and cost control (p=.737 and sig=.000), between return on asset and return on capital (p=.801 and sig=.000), return on asset and net profit margin (p=.819 and sig=.000), return on capital employed and net profit margin (p=.848 and sig=.000), between financial reporting and return on asset (p=.762 and sig=.000), between cost control and return on capital employed (p=.894 and sig=.000). Thus, implies that there is positive significant relationship between predictors of financial control and organizational performance of RBA.

Table 4.5: Coefficients of financial control and return on asset

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	.024	.098		.249	.804
Budget control	.462	.080	.518	5.756	.000
Financial reporting	.071	.122	.062	.578	.006
Cost control	.1230	.090	.427	4.800	.000

a. Dependent Variable: Return on asset

Source: Primary Data, 2019

The results in table 4.5 reveal that predictors of financial control have positive coefficients that enhance positive effect on the progress of return on asset in RBA. The regression analysis indicates that there is a positive significant relationship between financial control

and return on asset because all the calculated p-values are less than 0.05 each. Thus, the coefficient gives regression model, $Y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta$. Therefore, the model becomes $Y = .024 + .462x_1 + .071x_2 + .1230x_3$, this regression equation indicates that there is a positive significant between predictors of financial control and return on assets of RBA.

The first objective of establishing the relationship between cost control and return on asset has a positive and significant relationship (b=.462 and p=.000). The second objective of establishing the relationship between financial reporting and return on asset has a positive and significant relationship (b=.071 and sig=.000), the third objective of establishing the relationship between budget control and return on asset has a positive relationship (b=.1230 and p=.000). Thus, implies that there is a positive significant relationship between financial control and return on asset in RBA.

Table 4.6: Coefficients of financial control and return on capital employed

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	.045	.072		.625	.534
Budget control	.071	.059	.090	1.209	.032
Financial reporting	.299	.089	.299	3.345	.001
Cost control	.554	.066	.621	8.449	.000

a. Dependent Variable: Return on capital employed

Source: Primary Data, 2019

The results in table 4.6 reveal that predictors of financial control have positive coefficients that enhance positive effect on the progress of return on capital employed in RBA. The regression analysis indicates that there is a positive significant relationship between financial control and return on capital employed because all the calculated p-values are less than 0.05 each. Thus, the coefficient gives regression model, $Y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta$. Therefore, the model becomes $Y = .045 + .071x_1 + .299x_2 + .554x_3$, this regression equation indicates that there is a positive significant between predictors of financial control and return on capital employed of RBA.

The first objective of establishing the relationship between cost control and return on capital employed has a positive and significant relationship (b=.071 and p=.032). The second objective of establishing the relationship between financial reporting and return on capital employed has a positive and significant relationship (b=.299 and sig=.001), the third objective of establishing the relationship between budget control and return on capital employed has a positive relationship (b=.554 and p=.000). Thus, implies that there is a positive significant relationship between financial control and return on capital employed in RBA.

Table 4.7: Coefficients of financial control and net profit margin

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	.011	.055		.202	.841
Budget control	.034	.045	.0123	.7171	.001
Financial reporting	.740	.069	.732	10.788	.000
Cost control	.288	.050	.319	5.726	.000

a. Dependent Variable: Net profit margin

Source: Primary Data, 2019

The results in table 4.7 reveal that predictors of financial control have positive coefficients that enhance positive effect on the progress of net profit margin in RBA. The regression analysis indicates that there is a positive significant relationship between financial control and net profit margin because all the calculated p-values are less than 0.05 each. Thus, the coefficient gives regression model, $Y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \beta$. Therefore, the model becomes $Y = .011 + .034x_1 + .740x_2 + .288x_3$, this regression equation indicates that there is a positive significant between predictors of financial control and return on assets of RBA.

The first objective of establishing the relationship between cost control and net profit margin has a positive and significant relationship (b=.034 and p=.001). The second objective of establishing the relationship between financial reporting and net profit margin has a positive and significant relationship (b=.740 and sig=.000), the third objective of establishing the relationship between budget control and return on asset has a positive relationship (b=.228 and p=.000). Thus, implies that there is a positive significant relationship between financial control and net profit margin in RBA.

6. Conclusion and Recommendation

6.1. Conclusion

Most of the researches done in the related field to financial control and organizational performance in public institutions have revealed that there is positive significant relationship between financial control and return on investment with 0.006 calculated significance value which is lesser than 0.01 level of significance and p-value of .867 (Desmond, 2009). The findings of the study done by Allan (2001) on financial performance and organizational structure revealed that budget control has a significance relationship with organizational structure with a calculated significance value of 0.000 which is lesser than 0.01 with p-value of .901 in public institutions. Another study done financial monitoring and organizational performance demonstrate a positive significant relationship between financial monitoring and return on asset with calculated sig. of 0.00 which is less than 0.01 and p-value of 0.703 (Bonnie, 2009).

Thus, the findings of this study between financial control and organizational performance has also shown that there is a significant relationship between budget control and financial reporting ($p=.744$ and $sig=.000$), between budget control and cost control ($p=.583$ and $sig=.000$), between financial reporting and cost control ($p=.737$ and $sig=.000$), between return on asset and return on capital ($p=.801$ and $sig=.000$), return on asset and net profit margin ($p=.819$ and $sig=.000$), return on capital employed and net profit margin ($p=.848$ and $sig=.000$). Thus, implying that to improve organizational performance in RBA there should be improvement of financial control through ensuring budget control, financial reporting and cost control. The research finding have shown that there is a significant relationship between financial control and organizational performance implying that to improve organizational performance there should be financial control. Hence public institutions should do regular budget controls to enhance organizational performance in RBA.

6.2. Recommendation

Basing on the research findings, the researcher would like to recommend to the employees of RBA to ensure that they have knowledge on financial control in order to ensure organizational performance. The findings of the study have shown that a number of respondents do not do regular and on time financial performance. The researcher would recommend that financial report should be done regularly and on time to ensure organizational performance

Based on the findings of the study, the researcher would like to recommend to the managers and supervisors in RBA, to ensure that the departmental budgets meet departmental income and expenses in order to ensure organizational performance in RBA.

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Statistical Analysis of the Risk Factors Associated with Street Children's level of Interest to keep their Hygiene in Wolkite Town, Southern Ethiopia

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DOI: 10.29322/IJSRP.10.09.2020.p10569

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10569>

Abstract- Street children were a term for children experiencing homelessness who live on the street of a city, town or village. The main objective of this study was to identify the risk factors associated with interest of street children to keep their hygiene in Wolkite town. The target population for this study was street children in Wolkite town. Since the number of street children in the town was too small, we have not applied any of the sampling technique and have taken all the population subjects and we have got the data from 102 street children's out of 148 using self-administered questionnaire as an instrument of data collection from targeted population. Different statistical methods were used to analyze risk factor associated with interest of street children to keep their hygiene. We have applied the use of ordinal logistic regression analysis as method of statistical analysis taking manual backward elimination variable selection procedures. Among 102 respondents, 4 (3.9%) of them were children with high interest to keep their hygiene, 55 (53.9%) of them were children with medium interest to keep their hygiene and 43 (42.2%) were children with low interest to keep their hygiene. We concluded that, knowledge about STI and HIV transmission and prevention and reason of children to join the street life was found to be significantly affecting the interest of street children to keep their hygiene at 5% level of significance in Wolkite town. Hence everyone in the society including government agencies and NGOs must pay attention towards street children and look for ways to address their problems immediately.

Index Terms- Chi- Square, Hygiene, Ordinal Logistic Regression, Street Children, Wolkite

I. BACKGROUND OF THE STUDY

Street children were a term for children experiencing homelessness who live on the street of a city, town or village. Homeless youth were often called kids and street youth. The definition is contested, but many practitioners and policymakers use UNICEF's concept of boys and girls aged under eighteen years for whom "the street" including unoccupied dwellings and wasteland was become home or their source of livelihood and who was inadequately protected or supervised (Sarah *et al.*, 2009). Street children's were categorized as off street and on street that means who back to home at night and who stay on street at night respectively. Street children were used as a catch-all term, but

covers children in a wide variety of characteristics. Some street children, notably in more developed nations were part of a sub category called thrown away children, whom were children that have been forced to leave home. Thrown away children were more likely to come from single parent homes. They often are subject to abuse, neglect and exploitation (Flowers, 2010).

Street children could be found in a large majority of the world's cities, with the phenomenon more prevalent in densely populated urban hubs of developing or economically unstable regions, such as countries in Africa, Eastern Europe, and Southeast Asia (UNICEF, 2012).

According to a report from the consortium for street children, a United Kingdom-based consortium of related non-governmental organizations (NGOs), UNICEF estimated that 100 million children were growing up on urban streets around the world. Based on this estimate, 15 million of these are due to AIDS, and many more have been made vulnerable due to other cases. More recently the organization added, the exact number of street children is impossible to quantify (Sarah *et al.*, 2009).

Since most of African countries are developing countries, Street children's are found widely with an estimated 250,000 street children in Kenya and over 60,000 in the capital Nairobi (Cottrell, 2010).

According to the research conducted by UN World Poverty Index 2008, Sierra Leone was considered to be the poorest nation in the world. According to World Bank projections 2013/14 the current picture of Sierra Leone was ranked as the second fastest-growing economy in the world. Prevalent lack of child rights and extreme poverty remain widespread. According to a research of street children, there was close to 50,000 children relying upon the streets for their survival, a portion of them living full-time on the streets.

In sub-Saharan Africa, poverty, war, disease and broken homes were creating an environment in which millions of young people were turning their face to the streets. Of these, disease was one of the risk factors for youth on the streets of Africa. By 2010 HIV/AIDS would have an estimated 20 million children lost one or both parents, which was nearly twice the number of orphan in 2001 (UNICEF, 2003).

Since Ethiopia is one of the Sub-Saharan Africa countries, according to UNICEF and actively engaged NGOs, in Ethiopia, there were approximately 500,000-700,000 street children. Most of the Ethiopian street youth were involved in unhealthy

behaviors, such as smoking marijuana, drinking local drinks like “Tela, “tej”, “Areke” and chewing chat (UNICEF, 2003).

The street children were seen by many as worthless and many countries have used violent and punitive measures to eliminate them.

Wolkite is one of the towns which are found in SNNP Region in South-western Ethiopia. The number of children’s in Wolkite town, street were high. Hence, the increasing of street children in Wolkite town was due to urbanization. Based on this problem, we planned to conduct a study on the risk factors associated with level of interest of street children to keep their hygiene.

1.2. Statement of the problem

The children typically had accessed to neither health care nor education. Sometimes, they were subjected to violence in the home before joining the street. It is well known fact that street children were among the most vulnerable social group for poverty and under development in Ethiopia. In addition to these, Ethiopian children problems had been repeated by cyclical droughts, and recurrent famines, family strife and the infamous HIV/AIDS pandemic. All these factors have combined to make millions of children separated from their parents (Konstantin, 2004).

In SNNPS, the phenomena of street children had become the critical social problem of the towns in the region. The problem was mainly caused by poverty, rapid urbanization and family abuse (Azemraw, 2009). Even though there was no published data that indicates a rapid increase number of street children in SNNPS, Wolkite was one of the towns of the region encountering a growing of street children as high. The street children, who lived in Wolkite town, had no care, protection, supervision or direction from parents or responsible adults.

By realizing the overall nature of the problem, the aim of this study would be to determine and assess the risk factors associated with interest of street children to keep their hygiene in Wolkite town. The measure that was taken by community for solving the problem of street children was giving some needs like, food, cloth and others, instead of giving awareness to keep their hygiene. According to this problem, our study dealt with the magnitude of the problems and the root cause of the factors associated with interest of street children to keep their hygiene, using ordinal logistic regression model in Wolkite town.

1.3. Objectives of the study

The general objective of this study was to analyze the risk factor associated with interest of Street Children to keep their Hygiene in Wolkite town.

The specific objectives of our study are:

- To test the association between interest of street children to keep their hygiene (high, medium, low) and explanatory variables
- To determine the risk factors associated with interest of street children to keep their hygiene.
- To determine the level of interest of street children to keep their hygiene.

1.5 The scope of the study

This study was focused on identifying the factors that affected interest of street children to keep their hygiene (high,

medium, low) in all kebeles of Wolkite town. Therefore, the conclusion to be reached would reflect determinant and risk factors associated with interest of street children to keep their hygiene with a special reference to Wolkite town.

II. METHODOLOGY

2.1 Description of the Study Area

The study was conducted in Wolkite town which is located in South-western part of Ethiopia, in SNNP regional state, at the distance 158km from Addis Ababa. It is the capital city of Gurage zone. As the city is a developing town, many children were migrating from the rural area to the town and many of them were became street children. Therefore, this study considered the risk factors associated with interest of street children to keep their hygiene in Wolkite town.

2.1.1 Source of data

The targeted populations of this study were all street children in Wolkite town who would live in Wolkite town. The source of data for this study was street children in Wolkite town. The data was collected from street children in Wolkite town using questionnaire and interview. In this study we used both open and closed ended questionnaire to gather data from street children.

2.2 Method of data collection

The method of data collection in this study was by using structured self-administered questionnaire and interview. Once we decide what type of the study would be conducted, which was necessary to collect information about the concerned study. The relevant or necessary information for this study would take from primary data by questionnaire and interview. The data was used for this research project consisted of the number of street children lived in wolkite town.

2.3 Sampling design

2.3.1. Sampling Technique

Sampling technique is a system of taking small ratio of observation from large population with aim of getting information of those large populations from the sampled observation by using some statistical techniques. There are many random sampling techniques to determine the sampled observation. These are cluster, stratified, systematic, simple random sampling (SRS). However, in our study we do not use the above sampling techniques as our population is small to take a sample from it. Based on this reason we have included all the elements appeared in the study area.

2.4. Study Variable

2.4.1. Dependent variable

The dependent variable of this study was interest of street children to keep their hygiene classified as high, medium and low. High mean those children who have high interest to keep their hygiene, medium mean those children who have medium interest to keep their hygiene and low mean those children who have low interest to keep their hygiene.

High = 2
 Y_i = {Medium = 1}
 Low = 0

2.4.2. Independent variables

The independent variables of our study were age of children, sex, street life status, sleeping place, birth place, income sources, education level, interest to attend health education, knowledge about health information, knowledge about STI and HIV transmission and prevention, practicing method to prevent STI and HIV, reason to join the street life, meal taken by them per day, health condition, drug use, interest to use the drug and getting support and the detail of the explanatory variable and their coding's are depicted in Table 1A in the appendix.

2.5. Method of statistical analysis

The method of data analysis to be used for any study depends on the nature of the response variables incorporated and hence, two broad categories of statistics; classified as and inferential statistics was used for analyzing the data on street life of street children's level of interest to keep their hygiene.

Descriptive statistics deals with any method or procedures used to organize masses of numerical data in to a meaningful form by using various methods such as table, charts and graphs whereas inferential statistics includes the use of data from sample to make inference about a population from which the sample was drawn. The inferential statistics analysis involves with in this study were chi-square test of independence and ordinal logistic regression.

2.5.1. Chi-square test

Chi-square test of association is a method of analyzing categorical data that is obtain, in the form of counts. Chi-square test for association (independence) in a two way classification uses this procedure to test if the probability of items or subjects being classified for one variable depends on the other variable. The objective of chi-square test of independence is to test whether there was a relationship between two categorical variables or not.

The statistical test would be

$$x^2_{cal} = \sum_{j=1}^m \sum_{i=1}^n (o_{ij} - e_{ij})^2 / E_{ij} \dots \dots \dots (3.1)$$

Where, o_{ij}- is the observed class frequency
 e_{ij}-is expected cell frequency

The test x^2_{cal} with $x^2_{(c-1), (r-1)}$
 c- Number of column variables
 r- Number of row variables

Decisions; - if $x^2_{cal} > x^2_{(r-1)(c-1)}$ then reject Ho
 If $x^2_{cal} < x^2_{(r-1)(c-1)}$ then fail to reject Ho

P-value is the smallest level of the test for which the null hypothesis (Ho) is rejected. That is when p-value is greater than the significance level, Ho is not rejected

Since O_i and e_i are observed from a single sample of size n sum of the observed and expected class frequencies is the same that is

$$\sum_{i=1}^n O_i = \sum_{i=1}^n e_i = n \dots \dots \dots (3.2)$$

The hypothesis:
 H₀: there is no association between interest of Street Children to keep their Hygiene and all the other independent variables.
 H₁: there is an association between interest of Street Children to keep their Hygiene and all the other independent variables.

Assumption of chi-square

- The sample must be randomly selected from the population.
- The population must be normally distributed for the variable under study.
- The observation must be independent of each other.

2.5.2. Ordinal logistic regression

Ordinal logistic regression was a type of logistic regression analysis used, when the response variable is categorized more than two with having natural order or rank. That, we could rank the values, but the real distances between categories was unknown. Logit link function was used in the analysis because it was evenly distributed categories and was reasonable choices when the changes in the cumulative probabilities are gradual and logit involves all levels of the response and dichotomizes the response scale. Many variables of interest were ordinal that you can rank the values, but the real distance between categories was unknown. Ordinal logistic regression or (ordinal regression) was used to predict an ordinal dependent variable given one or more independent variables. This model will enable us to determine which of our independent variables (if any) had a statistically significant effect on our dependent variable. For categorical independent variables, we could interpret the odds that one "group" has a higher or lower score on our dependent variable. For continuous independent variables we were able to interpret how a single unit increase or decrease in that variable, is associated with the odds of our dependent variable having a higher or lower value. We could also determine how well our ordinal regression model predicts the dependent variable.

The ordinal logistic model

Data: (Y_i, X_{1i}, . . . , X_{ki}) for observations i= 1, . . . , n, where Y is a response variable with C ordered categories i or j = 1, . . . , C, and probabilities π(j) = P(Y = j) X₁, . . . , X_k are k explanatory variables Observations Y_i are statistically independent of each other The following holds for γ^(j) = P(Y_i ≤ j) for each unit I and each category j = 1, . . . , C - 1:

$$\log\left(\frac{y_i^{(j)}}{1 - y_i^{(j)}}\right) = \log\left(\frac{p(Y_i \leq j)}{p(Y_i > j)}\right) = \alpha(j) - (\beta_1 X_{1i} + \dots + \beta_k X_{ki}) \dots \dots \dots (3.3)$$

Assumptions of ordinal logistic regression

- The dependent variable is measured on an ordinal level.
- One or more of the independent variables are continuous, categorical or ordinal.
- No Multi-co linearity - i.e. when two or more independent variables are highly correlated with each other.
- Proportional odds - i.e. that each independent variable has an identical effect at each cumulative split of the ordinal dependent variable.

These assumptions should be tested in order to show if there is a violation assumption or not. If these assumptions are violated the results you get when running ordinal regression may not be valid.

2.5.2.1. Likelihood-Ratio Test

An alternative and widely used approach to test the significance of a number of explanatory variables is to use the likelihood ratio test. This is appropriate for a variety of types of statistical models. Agresti, 1990 argues that, the likelihood ratio test is better particularly if the sample size is small or the parameters are large. The likelihood-ratio test uses the ratio of the maximized value of the likelihood function for the full model (L₁) over the maximized value of the likelihood function for the simpler model (L₀). The likelihood-ratio test statistic equals:

$$-2 \log \left(\frac{L_0}{L_1} \right) = -2[\log(L_0) - \log(L_1)] \dots \dots \dots (3.4)$$

It is compared with a χ^2 distribution with 1 degree of freedom. This log transformation of the likelihood functions yields a chi-squared statistic.

2.5.2.2. Goodness of Fit of the Model

The goodness of fit measures how well the model describes the response variable. Assessing goodness of fit involves investigating how close values predicted by the model with that of observed values (Bewick, 2005).

2.5.2.3. Parameter Estimation for Logistic Regression

The maximum likelihood and non-iterative weighted least squares are the two most computing estimation methods used in fitting logistic regression model. In contrast, the maximum likelihood estimation method is appropriate for estimating the logistic model parameters due to this less restrictive nature of the underlying assumptions in this study the maximum likelihood estimation technique applied to estimate parameters of the model. Maximum the likelihood estimate (MLE) of θ is that value of θ that maximized link (θ): it is the value that made the observed data

the “most probable”. If they are identical independent distributions, then the likelihood simplified to:

$$\text{link}(\theta) = \prod_{i=1}^n f\left(\frac{x_i}{\theta}\right) \dots \dots \dots (3.5)$$

Rather than maximizing this product which could be quite tedious, we often used the fact that the logarithm is an increasing function so it would be equivalent to maximized the log likelihood:- $l(\theta) = \sum_{i=1}^n \log(f\left(\frac{x_i}{\theta}\right)) \dots \dots \dots (3.6)$

2.5.2.3. Parallel Lines Test

In ordinal logistic regression models, there is an important assumption which belongs to ordinal odds. According to this test parameters should not change for different categories. Also parameter estimations do not change for cut-off points. In an ordinal logistic regression, when the assumption holds for $j - 1$ logistic comparison in a J categorized variable α -1 cut-off points and $j - 1$ parameters are found. At this point ordinal logistic model differs from multinomial logistic regression (Kleinbaum *et al.*, 2010).

In a way, this test states that the dependent variable’s categories are parallel to each other. When the assumption does not hold, it means that there are no parallelism between categories. Likelihood Ratio Test, Wald Chi-Square test and the other related tests are used to test parallel lines assumption (Agresti *et al.*, 2002). In ordinal logistic regression, these tests examine the equality of the different categories and decides whether the assumption holds or not. If the assumption does not hold, interpretations about results will be wrong, therefore in order to find correct results alternative models are used instead of ordinal logistic regression models.

III. RESULT AND DISCUSSION

3.1. Descriptive Statistics and Inferential Statistics

The data gathered from respondents was analyzed using both descriptive and inferential statistics, by using SPSS software.

3.1. Descriptive Statistics

From the result in Table 4.1, out of 100% 0.98% were children with high interest to attend health education, 48% were medium interest children to attend health education and 50.98% were children with low interest to attend health education, 3.92% were children with high interest to keep their hygiene, 53.92% were medium hygiene children and 42.16% were children with low interest to keep their hygiene. For other variables descriptions detail was here below in Table 4.1.

Table 1 Descriptive statistics of demographic Variables

Variables	N	Percentage
Sex	Male	43 42.2%
	Female	59 57.8%
Birth place of respondent	Urban	96 94.1%
	Rural	6 5.9%
Income source of respondent	Labor work	40 39.2%
	Begging	48 47.1%

	Theft	14	13.7%
Education level of respondent	primary school	85	83.3%
	secondary school	3	2.9%
	Illiterate	14	13.7%
Sleeping place of respondent	Home	59	57.8%
	on the street	15	14.7%
	around building	28	27.5%

Table 2 Descriptive statistics of other Variables

Variables		N	Percentage
Interest of respondent to keep his/her hygiene	High	4	3.9%
	medium	55	53.9%
	low	43	42.2%
street life status of respondent	off street	59	57.8%
	on street	43	42.2%
interest of respondent to attend health education	high	1	1.0%
	medium	49	48.0%
	low	52	51.0%
knowledge of respondent to have health information	yes	36	35.3%
	low	66	64.7%
Knowledge of respondent about STI & HIV transmission and prevention	yes	65	63.7%
	no	37	36.3%
practicing method of respondent to prevent STI&HIV	yes	26	25.5%
	no	76	74.5%
Reason of respondent to join the street life	urbanization	10	9.8%
	peer influence	10	9.8%
	being orphan	36	35.3%
	poverty	32	31.4%
	family conflict	14	13.7%
meal taken by respondent per day	once	1	1.0%
	twice	45	44.1%
	three times	56	54.9%
Rate of health condition of respondent	fair	52	51.0%
	poor	50	49.0%
Drug use	yes	37	36.3%
	no	65	63.7%
Interest of respondent to use drug	non	65	63.7%
	high	5	4.9%
	medium	21	20.6%
Getting support	low	11	10.8%
	yes	55	53.9%
	no	47	46.1%
Total		102	100.0%

3.2. Inferential statistics

3.2.1. Chi-square test for association and cross tabulation

The association between dependent and independent variables among the statistical analysis about the risk factors associated with interest of street children to keep their hygiene in Wolkite town is tested by using chi-square test

As we can see from the result by Chi-square test of association in Table 4.2, there was statistically significant association between the Interest of street children to keep their hygiene with age of children, income sources, education level, interest to attend health education,

Table 4.2. Chi-Square Test Statistics of the Variables

Variables	Pearson chi-square	Degree freedom(d.f)	Sig
Age	110.690 ^a	26	.000
Birth place	5.448 ^a	2	.066
Income source	41.380 ^a	4	.000
Education level	76.984 ^a	4	.000
street life status	.922 ^a	2	.631
interest to attend health education	95.505 ^a	4	.000
knowledge about health information	38.490 ^a	2	.000
Knowledge about STI & HIV transmission and prevention	65.493 ^a	2	.000
practicing method to prevent STI & HIV	23.408 ^a	2	.000
Sleeping place	1.260 ^a	4	.868
Reason to join the street life	36.286 ^a	8	.000
meal taken per day	12.401 ^a	4	.015
Rate of health condition	6.738 ^a	2	.034
Drug use	37.427 ^a	2	.000
Interest to use drug	38.610 ^a	6	.000
Getting support	10.304 ^a	2	.006

knowledge about health information, knowledge about STI and HIV transmission and prevention, practicing method to prevent STI and HIV, reason to join the street life, meal taken by them per day, health condition, drug use, interest to use the drug and getting support. However, Street life statuses of children, birth place and sleeping place have no significant association with interest of street children to keep their hygiene.

4.2.2. Ordinal Logistic Regression Analysis

Logit link function is used in the analysis of distributed categories and is reasonable choices when the changes in the cumulative probabilities are gradual and logit involves all levels of the response and dichotomizes the response scale.

In the Parameter Estimates Table 3, for those covariates under the table, whose p- values were less than 5% they had statistically significant effect on the interest of street children to keep their hygiene ; otherwise not.

The estimate for [hygiene=1] is the cutoff value between low and middle hygiene and the estimate for [hygiene=2] represents the cutoff value between middle and high hygiene. For [hygiene=1] that was the estimated cut point on the latent variable used to differentiate low hygiene from middle and high hygiene when values of the predictor variables are evaluated at zero. The estimate that had a value of 2.819 or less on the underlying latent variable that gave rise to our hygiene variable would be classified as low hygiene given they were children with knowledge about STI & HIV transmission and prevention (the variable reason to join the street life evaluated at zero, its reference value). [Hygiene=2] –this is the estimated cut point on the latent variable used to differentiate low and medium hygiene from high hygiene when values of the predictor variables are evaluated at zero. Subjects that had a value of 23.397 or greater on the underlying latent variable that gave rise to our hygiene variable would be classified as high hygiene given they were children with knowledge about STI & HIV transmission and prevention and had zero reason to join the street life evaluated. Subjects that had a value between 2.819 and 23.397 on the underlying latent variable would be classified as medium hygiene.

Estimate- these are the ordered log-odds (logit) regression coefficients. Interpretation of the ordered logit coefficient was that for one unit increase in the predictor, the response variable level was expected to change by its respective regression coefficient in the ordered log-odds scale while the other variables in the model were hold constant.

Odds ratios of the predictors can be calculated by exponentiation the estimate.

Knowledge about STI & HIV transmission and prevention- That was the ordered log-odds estimate for one unit increase in knowledge about STI & HIV transmission and prevention on the expected hygiene level given the other variables were held constant in the model. If a subject were to increase their knowledge about STI & HIV transmission and prevention, their ordered log-odds of being in a medium to low hygiene category would decrease by $\exp(-14.8900)=3.41 \times 10^{-7}$.

Reason to join the street life-That was the ordered log-odds estimate for one unit increase in reason to join the street life on the expected hygiene level given the other variables were held constant in the model. A one unit increase in reason to join the street life would result in an $\exp (-1.456) =0.233$, One unit

However the goodness-of-fit statistics in Table 5 suggests the model fit the data fits well. Our analysis suggest the model does fit very well ($p > 0.05$) (i.e. Fail to reject the null hypothesis depending on the observed data). Also the model fits adequately.

Table5 Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	23.726	41	.986
Deviance	25.959	41	.968

Pseudo values (Nagelkerke = 99.7%) indicates that there was relatively small proportion of the variation in assessment for the predictor.

Table 5. Pseudo R-Square		
Cox and Snell	Nagelkerke	McFadden
.806	.997	.992

The test of parallel lines in Table 6 the null hypothesis of the assumption of proportional odds. The null hypothesis states that the location parameters (slope coefficients) are the same across response categories. We fail to reject the null hypothesis; we conclude that the assumption holds.

Table 6. Test of Parallel Lines

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Null Hypothesis General	41.764	41.764	7	.000 ^b

IV. DISCUSSION OF THE RESULTS

The findings indicate that the knowledge about STI and HIV transmission and prevention and reason of children to join the street life have significantly with the interest of street children to keep their hygiene. Knowledge about STI and HIV transmission and prevention and reason of children to join the street life were the variables with negative effect on the interest of street children to keep their hygiene. Based on the chi-square results, the variables like; age of children, income sources, education level, interest to attend health education, knowledge about health information, knowledge about STI and HIV transmission and prevention, practicing method to prevent STI and HIV, reason to join the street life, meal taken by them per day, health condition, drug use, interest to use the drug and getting support were significantly associated with interest of street children to keep their hygiene. However, Street life statuses of children, birth place and sleeping place have no significant association with interest of street children to keep their hygiene. By taking the variables with significant association with interest of street children to keep their hygiene in chi-square result and check their levels using ordered log-odds, we found knowledge about STI and HIV transmission and prevention and reason of children to join the street life that were significant effect on dependent variable. But the others like, age of children, income sources, education level, interest to attend health education, knowledge about health information, practicing method to prevent STI and HIV, meal taken by them per day, health condition, drug use, interest to use the drug and getting support had no significant effect on dependent variable. By relating this study with other studies that were discussed in literature review, like the study conducted in Addis Ababa by

Demelash *et al.*, 2013 on Assessment of Sexual and reproductive health status of street children by using binary logistic regression model, showed that females were sexually active than males and females tended to have multiple sexual partners. More than half of the street children did not attend any kind of sexual or reproductive health education programs. According to the interviewed responses and results of test, males have no more information on available services than females. The overall male to female ratio of 3:1 were “on the street” type while the rest were “off the street” type. The reasons mentioned by the researcher or causes to join the street life are job searching, peer influence, family disharmony, orphaned, poor family and alcoholic parents. The above reasons pushed children mainly boys to engage in street activities. Almost one-third of street children claimed to have been supported by one organization at least once, but they had left and come back to the streets. The remaining never been helped and were using the service.

The study conducted by Genet on factors associated with Orphans and Vulnerable Children in Organization for Social Service of AIDS (OSSA) in Hawassa, using binary logistic regression showed that the factors such as education level, sex, peer influence, shelter, sexual activity and reason of joining the street had statistically significant effect on status of street children and other variables were insignificance (Genet, 2014).

The other study conducted by Alemu *et al.*, in 2014 on the magnitude of the problem and risk factor associated with street life of street children in Gondar. Using binary logistic regression model showed that, the factors such as gender, school attendance, shelter, sexual activity and reason of joining the street had

statistically significant effect on the life of street children. In general, the consequence of “on” the street is greater than that of “off” the street.

V. CONCLUSIONS AND RECOMMENDATION

5.1. Conclusions

The main objective of this study was to analyze the risk factors associated with interest of Street Children to keep their Hygiene in Wolkite town. In this analysis we had looked at regression models that could be applied when our outcome was represented by an ordinal variable. Furthermore, the findings indicated that the interest of street children to keep hygiene is associated with knowledge about STI and HIV transmission and prevention and reason of children to join the street life at 5% level of significance.

Hence, we conclude that knowledge about STI and HIV transmission and prevention and reason of children to join the street life was found to be significantly associated with the interest of street children to keep their hygiene at 5% level of significance in Wolkite town.

5.2. Recommendation

Based on finding result of the study the following recommendations were forwarded to:

- Government, NGOs and concerned bodies have to play important roles to give awareness to street children about STI and HIV transmission and prevention.
- Government agents, NGOs, religious institution and even individuals should have to straggles to avoid the causes of reasons of children to join the street life.
- Further study in the area should be conducted including the possible covariates in to account in the study.

VI. ACRONYMS

AIDS: Acquired Immune Deficiency Syndrome, HIV: Human Immune Virus, NGOs: Non-governmental Organizations, O SSA: Organization for Social Service of AIDS, RA: Rehabilitation Agency, SNNP: South Nation Nationality and People, SRH: Sexual and Reproductive Health, STDs: Sexual Transmitted Diseases, UN: United Nation, UNICEF: United Nation’s International Children Emergency Fund.

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Firm competitiveness and sustainability in telecommunication industry. Study of MTN Rwanda.

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DOI: 10.29322/IJSRP.10.09.2020.p10570

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10570>

Abstract- This research sought to find out whether the firm can be competitive and remain sustainable when other firms enter in the in-telecommunication sector and increase the highly competitive age. The study was guided by the following objectives; to investigate competitiveness of MTN Rwanda in telecommunication industry, to assess sustainability of MTN Rwanda in telecommunication industry, and to find out the relationship between competitiveness and sustainability of MTN Rwanda. The study used case study approach, mixt methods approach quantitative and qualitative were adopted to conduct the study. The targeted population of this research was 287 MTN Rwanda' employees. 167 employees were selected purposively as sample size. The research used a case study approach to give an in depth understanding of competitiveness and sustainability of MTN Rwanda. The study used both primary and secondary data where primary data was collected using questionnaires and interview and secondary data was collected from report, and other publications at MTN Rwanda. Information was gathered using quantitative, qualitative and historical data approach, close ended questionnaires and interview guide were employed to achieve better results. Information gathered were presented using tables, charts and figures while analyzing data collected. The study revealed that MTN Rwanda uses number of strategies to remain competitive and sustainable such as Porter's generic strategies (product differentiation, low cost leadership and focus), Brand and product line, and channel of distribution/ value chain. The study discovered that MTN Rwanda is competitive on telecommunication industry as it keeps increasing the market share (54%) compare to its competitors (46%), the number of subscribers is kept on increase trend 4, 874 797 against its competitor Tigo-Airtel 4,165,530. The study highlights MTN Rwanda increased it profit in past 3 years under scope and the rating received on industry stability between 3 and 5 which is high rating. The study further concluded that there is a positive relationship between competitiveness and sustainability based on market share and profit increase that the firm has had in 3 consecutive years. The study recommends that a firm to be competitive and sustainable should have a competitive advantage and clear strategies in place. The study was case study of one firm could not be expended to include more firms. Hence further research should be done to include other firms in different industry to enhance the comparison.

Index Terms- Competitive, Sustainability, Market Share, Telecommunication, MTN, Airtel

I. INTRODUCTION

Information age had led the telecommunication sector increase into diversification to help the development of technological development for good services required by government (Sultan & Mehmood, 2012). Telecommunication in Africa has opened up new vistas of business opportunities. Africa was the fastest growing mobile market in the world during the past ten years with 650Mn subscribers (World Bank report December 2012). Mobile usage is increasing day by day in Africa compare to United States, European Union and anywhere else in the world. The mobile telecommunication industry in Rwanda recently become competitive. There was a high competition MTN Rwanda and Tigo related to price. Tigo strengthened its market and started more products to attract more customer and MTN Rwanda responded by new products and by revising its price downward. Recently, the price wars resulted to reduce price rates on telecommunication product in Rwanda with the tree firms trying to maintain and fascinate additional customers and remain competitive in the market, hence growing their market share and find sustainability. Rwanda Government allowed the third telecom company to operate on Rwanda telecoms market, this means Rwanda regulatory authority (RURA) has licensed tree mobile operators namely, MTN Rwanda 2006, Tigo 2008 and airtel 2011 respectively, the continued growth of telecoms in the industry is clear indication that there is still a market share to operate that may offer competitiveness.

In light to the above considerations, the greatest impediments underlying telecommunication companies, sales growth emanating from primary demand is less costly and more profitable than attained by taking share from competitors. However, losses in market share may signal serious long-term issues that necessitate strategic change (Farris *et al.* 2010). Initially there was only one player operating in Rwanda market since 1998 with 100% market share with 138,728 subscribers in 2004 after being licensed in 2003. However, two new licensed telecommunication firms namely (Tigo 2008 and Airtel 2011) made the industry vibrant and very competitive where MTN had 3,033,421, tigo Rwanda 1,615,585 and Airtel 10,304 subscriber respectively.

The firm employ various competitive strategies to sustain in the industry. Many researchers have conducted study on firm competitiveness and sustainability industry, For example, a study by Ishimwe (2013) concentrated on marketing strategy or market share growth in telecommunication for Tigo Rwanda and a study by Isabane (2012) focused on competitiveness in Microfinance in Rwanda, but none of them focused on Firm competitiveness and sustainability in telecommunication industry. This paper assess the correlation between competitiveness and sustainability of a company in telecommunication industry in Rwanda.

This research was conducted basing on the following objectives:

- i)To investigate competitiveness of MTN Rwanda in telecommunication industry
- ii)To assess sustainability of MTN Rwanda in telecommunication industry
- iii)To find out the relationship between competitiveness and sustainability in Telecommunication industry case study of MTN Rwanda.

II. LITERATURE REVIEW

Husso (2011), carried out a study in USA and Europe on competition mobile phone market of United State of America and Europe, that research used a descriptive research design. The findings revealed that the USA and European markets were fundamentally not the same. Despite the fact that European numerous corresponding sale channels of distribution occur. In addition, in United States market phones were considerably sold deeply subsidized and bundled the operation brand of co-branding contracts, moreover, the United States market had fragmented in two technologies, GSM and CDMA as contracting with Europe where GSM has been the pertinent technological elements adopted.

A study on subject of strategic management in telecommunication sector to establish a strong competitive advantage has been carried out in Europe by Zuhdi (2012) with the aims to assess strategies and model that telecommunication companies may control not only to withstand but to struggle in ever-adjusting technology intensive telecommunication sector. This survey assessed structure of telecommunication sector and their competition. It was demonstrated that companies were facing clear competition pressure from old and new companies. For the moment, technological advancement and telecommunication companies are progressing. Firms had to change their setup and transactional approach to adjust and ameliorate the sector. The research found that the survey outcome was in line with elements in the blue ocean strategy.

Zhang (2008), conducted a research on complete advantage analysis of the telecommunication companies in post Chinese telecommunication reconstruction era. This research evidenced the impacts of reforms on competitive advantage for firms with reference to Chinese mobile with special emphasis on reform in 2008.

Several challenges affected Chinese telecommunication companies after a reform in comparison to China Unicom and China Telecom, there are more competition for China Mobile. The greatest impediments comprises of low capacity of advancing full services business and attaching challenges, weak marketing

resources for home and group market as well as poor internet business assistance were unprotected after this reform.

According to Wallin (2007) who conducted a study on how companies can increase their market shares. The study used descriptive methods where evidences emanates from the existing literature, internet source and firm reports, interviews and questionnaire survey with qualitative and quantitative approaches have been adopted for workers, staff members, competitors and clients and vast volume of information obtained were recapitulated and discussed by utilizing various marketing strategies culminating in concluding remarks and recommendations for the company to attain the right marketing decision targeting for large share of marketplace.

The research established that markets demand various products or services and is expected to be managed in dissimilar way. Japanese market is highly secured for foreign corporation, desire to be advanced in Japanese language, demand high quality and quick service plus the highest technical level. However, Russian market is improving at the moment. The Russian market includes much of possible.

Ade (2012) also did a study on strategic quickness and focused on success in Nigerian telecommunication sector. The research revealed that it impacts the focused performance of media transmission firms in Nigeria and that there exists a big connection between strategic quickness and competitive success. Twagira (2012) conducted a study on Marketing for the competitiveness of the telecommunication Rwanda case study MTN Rwanda. The aim of the study was to found out if the marketing contribute to the competitiveness of MTN Rwanda, to achieve this the study applied descriptive method where the analytical and comparative techniques were used, the primary and secondary data were gathered through questionnaire, interview, historical information and reports. The study found that marketing contribute significantly to the competitiveness of MTN Rwanda, where the customer base continue to increase year on year basis as result of brand awareness, strong marketing such as advertisement, publicity and promotion across the country and finally roadshow to attract more customer to use MTN Rwanda product.

) investigated the nature of competition in the Ghanaian telecommunication sector. The purpose was to evaluate the nature of competition and its effects on telecommunication sector adopting airtel Ghana Limited as a case study. Results evidenced that the sector is focused, the competitive used were cost leadership, differentiation and emphasis, motivational factors in competitive ways between recent competitors and making a deal of clients and the stations competitive way are costs, new product progress and promotional strategies. This research assesses the gap including ignorance of some strategies including client loyalty, investments in study on new product growth and knowledge at internal marketing.

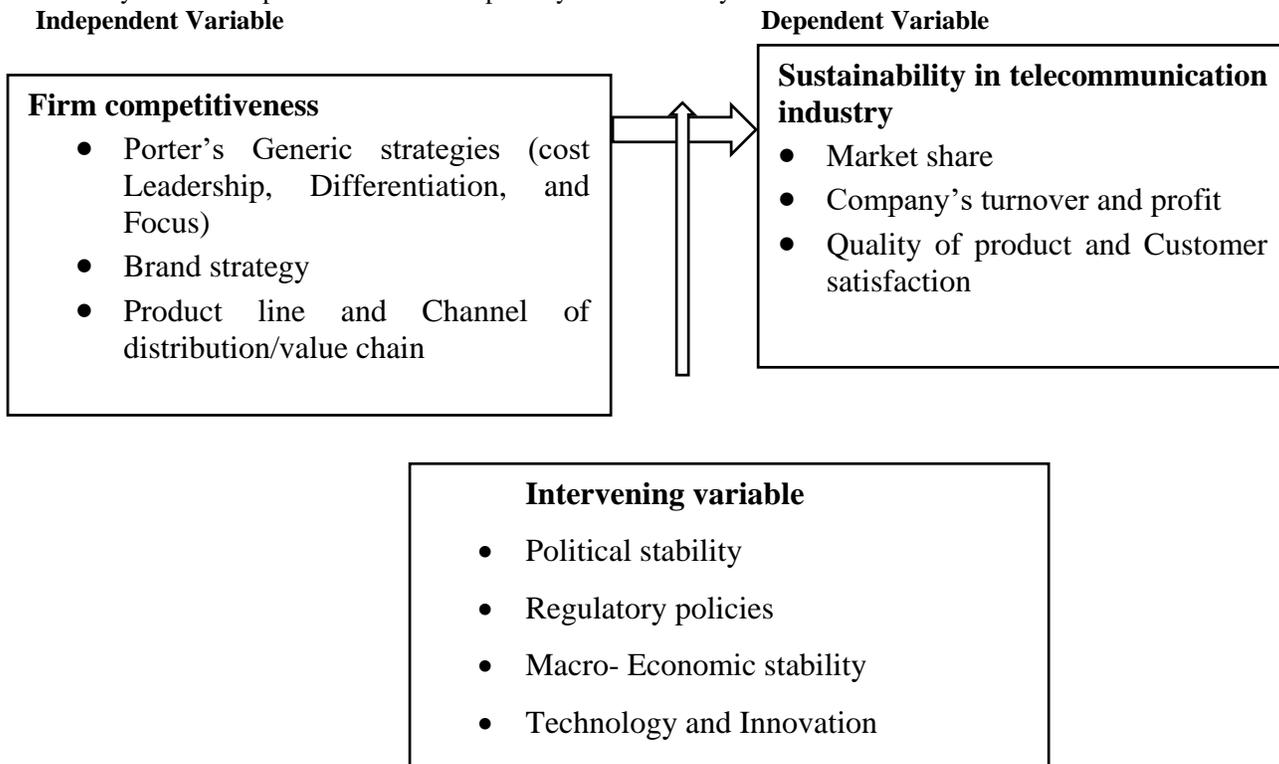
Ndhiwa (2010) while looking at the relationship of competitive approaches in Safaricom Kenya, he found that the strategies used by Safaricom included cost diminishments, excellent client service, operational productivity, creating brand or name among numerous techniques. The investigation moreover showed a noteworthy connection between strategies used by companies including Safaricom Kenya and its profitability.

Uwimana et al (2016), assessed the contribution of marketing mix the success of Rwanda communication companies

with reference to MTN Rwanda. It found that the marketing mix is effective in MTN Rwanda and contribute to the success of the company, additional studies establishes that return on equity for MTN during the period understudy has increased where ROE was 8.3%(2013), 5.3% (2014) and 17.8% (2015) respectively, therefore that means on Frw 100 invested by MTN generate 8.3%, 5,3% 17.8% in the respective years, while return on asset were 8.1%, (2013), 2.8%(2014) and 1,1% (2015) respectively hence decrease trend but with positive income. The study concluded that the firm had a good performance as result of marketing mix implemented during the said period understudy. To achieve this, the study used descriptive method where primary and secondary

information has been gathered using questions, interview, report and documented strategy.

The conceptual framework focuses on the interaction among intendent, dependent and intervening variables. For this study, it is to access the factors, which ensure MTN Rwanda competitiveness and its sustainability in telecommunication industry such as competitive strategy, brand strategy, product line and channel of distribution or value chain, market share, company turnover and profit, quality of product and customer satisfaction, customer base, etc. The said factors can be demonstrated in figure 1 named independent and dependent variables.



III. MATERIALS AND METHODS

This study, qualitative and quantitative methods for analyzing information were employed. The research design used was mixt Method (quantitative and qualitative).Therefore, a descriptive research was chosen as the same meaning, it is expected to define the current status while discussing the existing and be taken for visual assistance like graphs and charts analyzing the existing data and be used for visual aid such as graphs and charts.

Target population is composed of MTN Rwanda’s employees. The study indicates that there are twenty-five (25) members of senior Management and Board of Directors: thirty (30) Middle Managers and rest of employees are two hundred and thirty two (232). In total, there are 287 MTN employees all over the country. To define the Sample size Yamane’s simplified formula was used as follow:

$$n = \frac{N}{1+Ne^2}$$

Source : Yamane (1967:886).

When n is the Sample Size, N is the population size and e is the degree of precision. The confidence level was considered to be 95%, this formula was practice in Table 3.2 below. With N=287 employees; e=5%; considering the confidence levels of 95%; n is equal 167 employees grouped in 3 levels.

The 167 staff members were purposively chosen as a sample size for the study to meet qualities depending on the information that they most likely have and since the positions they occupy in the organization were the strategy of the organization is developed and operationalized. Therefore, the sample was drawn from form part of the high-level management, middle management and the rest of employees of the company and are usually involved in the business planning and hence strategic planning and implementation process of the company. They range from, Executives/ General Managers (First level), Senior Managers (second level), Middle Managers (third level), and rest of employees.

For analyzing quantitative information, statistical package for social sciences (SPSS) version 22.0 and Ms Excel were used.

Interview and questionnaires were expressed in different format such as tables, graphics and the analysis of percentages were done through Microsoft excel spread sheet application which organizes data in columns and rows to be manipulated through formulas to allow researcher to easier interpreted the collected data from interviews and questionnaires. Qualitative information was analyzed based on information collected from interview using a content analysis

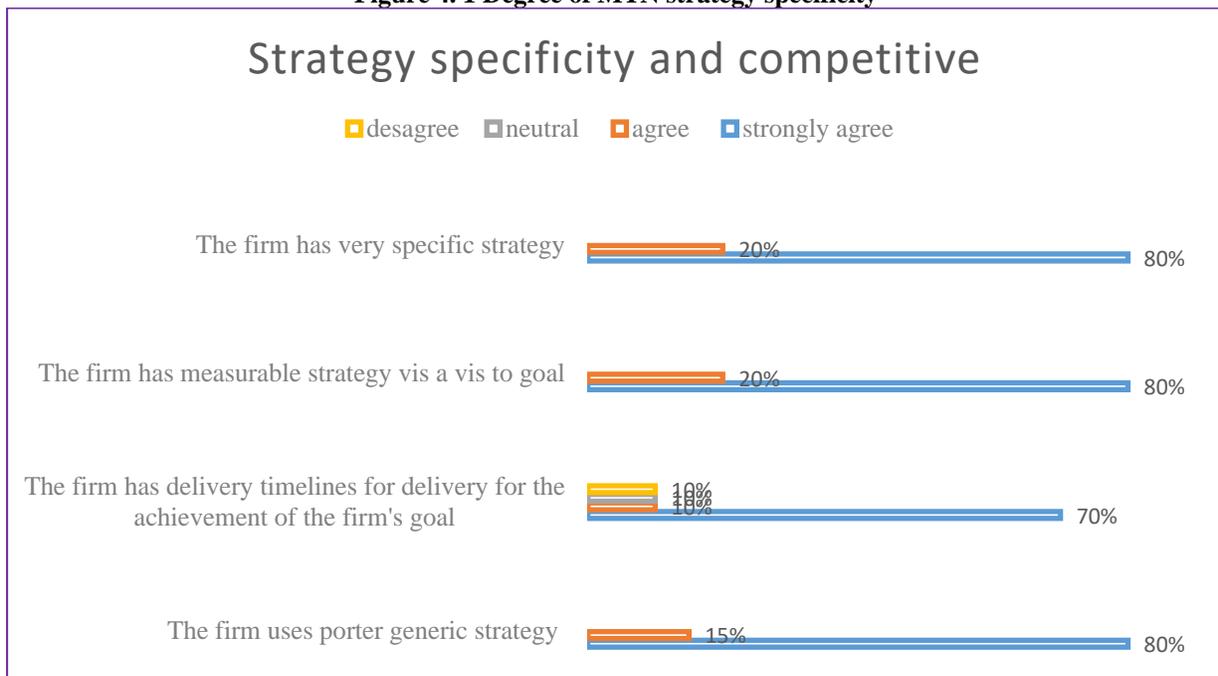
competitiveness strategies used by MTN in telecommunication sector of Rwanda. The second part comprises of the level of sustainability of MTN in telecommunication sector in Rwanda, and the third part established the correlation between competitiveness and sustainability in telecommunication industry in Rwanda.

The investigation of competitiveness strategies used by MTN was measured by strategy specificity and competitiveness: One of the parameter addressing the perception on the level of using strategy specification contains mission, objectives, policies or action plans and resource allocation activities or decisions made by organizations. Respondents were asked to provide their level of agreement relying on their experience

IV. RESULTS AND DISCUSSION

The researcher collected both qualitative and quantitative information from 167 respondents. The first parts contain

Figure 4. 1 Degree of MTN strategy specificity

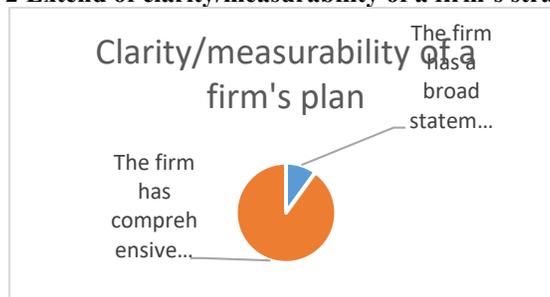


Source: Field survey (2020)

The average of 80% of respondents strongly agree that a firm had a very specific strategy. In response to specific questions, 80% strongly agreed that an organization had clear strategy. Moreover, 80% of respondents strongly agreed that company had quantifiable strategy concerning their objectives, 70% of respondents strongly agreed that company had adequate time provision. Moreover, 80% and 20% of respondents strongly agreed and agreed that company

utilizes Poter’s generic and SWOT analysis as competitive strategy instruments. The key difference in opinion between the (90%) who were of the view that an organization had written, widespread statement of its plans as well as suitable and quantifiable activities to follow up the success or development.

Figure 4. 2 Extend of clarity/measurability of a firm’s strategic plans



Source: Field survey (2020)

The study demonstrate that the organisation possess clear statement of its plans which strongly and quantifiably activities to follow up the success of the organization and continue to progress, further it clarify that the firm is flexible to change based on fundamental circumstance to ensure it remain competitive and sustainable on the market. The measurement was to understand how a firm's strategy plans are communicated to members.

Calantone & Schatzel (2000) on communicating one's strategic was to "inform or influence the target audience in several ways. Porter (1980) describes the means of communicating with customers as any action by a firm that provides a direction or indirect indication of its intentions, motives, goals, or internal situation."

Figure 4. 3 Firm's strategic plan communication



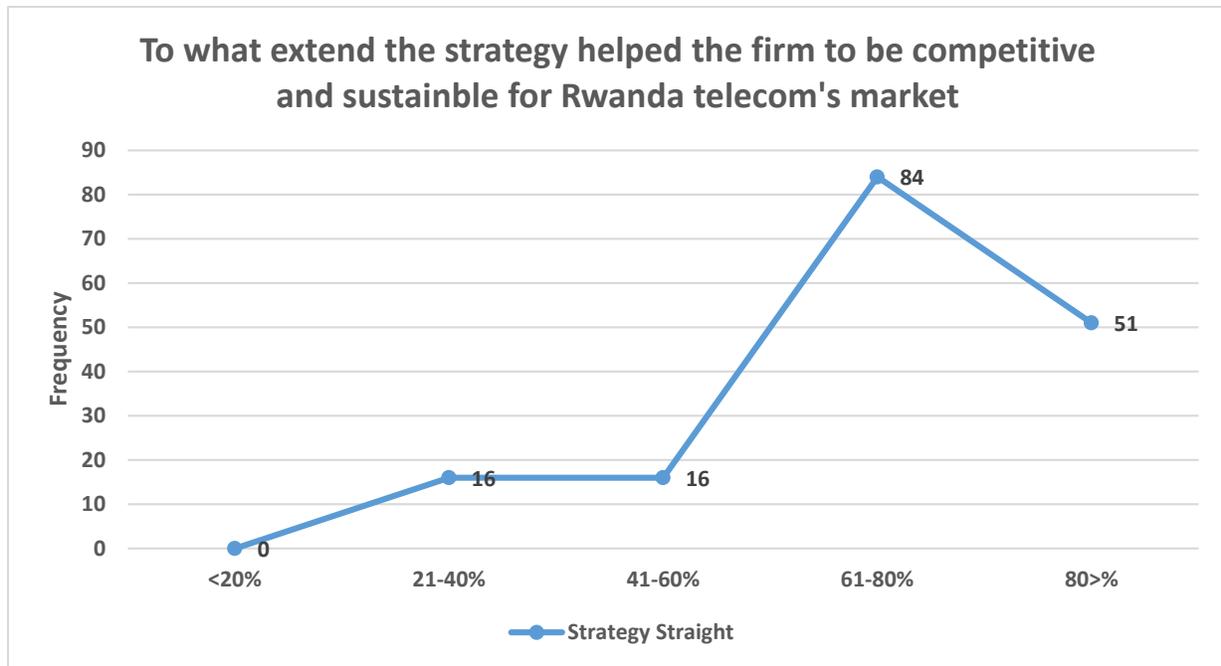
Source: Field Survey (2020)

Majority of respondents ascertain that (70%) indicated that verbal communication was the most widely used method. It is however evident that some effort is put in disseminating the firm's strategy plans to all members of the organization through either a documented or verbal approach. In this instance, majority indicated based on their experience in MTN that the verbal approach was widely used.

The second research objectives assessed the level of sustainability of MTN Rwanda. In telecommunication sector in

Rwanda. The sustainability was assessed using to what extent does the strategy in place helped to be more competitive and sustainable on Rwanda telecommunication market. Based on the study findings, 50 of the firm confirmed between 61-80% while 30 indicated that the strategy in place helped the firm to be competitive and sustainable over 81%. It is pertinent that most of respondents (80%) opined that the strategy in place helped the firm to be competitive and sustainable between 61% and above

Figure 4. 4 To what extend the strategy helped the firm to be competitive and sustainable for Rwanda telecom’s market



Source: Field survey (2020)

However, On question to ensure that distribution channel strategy is among strategy that is helping the firm to be competitive and sustainable on telecommunication market in Rwanda 60 % (101) of respondents strongly agreed that the distribution channel strategy is being used to deliver MTN products to the end user, while 20% (33) agreed and 20% neutral (33), despite the 20% (33) neutral, this was evidenced by vehicles and motorcycles that MTN Rwanda distributed currently to super and sub-dealers as means of delivering their products to end user.

Table 4. 1 Telecommunication company subscribers

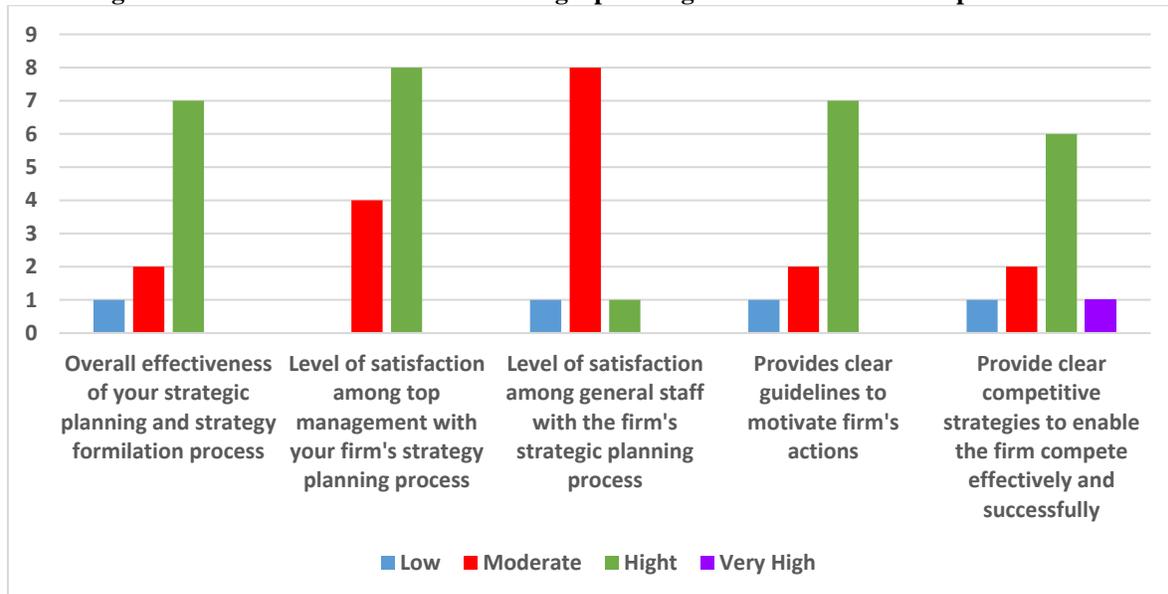
Operator	Mobile active subscribers'	Percentage
MTN	4,874,797	54%
AIRTEL -TOGO	4,165,530	46%

Total 9,040,327 100%

Source: Source RURA report (2019)

Looking at the table 1, there is a clear indication that MTN Rwanda has performed considerably well compare to its peers in telecoms industry, particularly in market share. The company has shown growth in market share even in the mist of strong completion in the past 2-3 years. None of its competitors may also boast of the consistent degree of overall performance and success that MTN has achieved in Rwanda, therefore this indicator shows that the firm is profitable and financially stable in telecoms markets. The respondents indicated that MTN Rwanda is not yet listed on stoke exchange in Rwanda rather their shareholders (Cristal Venture). All respondents did not respond on this question because they felt it was not applicable to this market.

Figure 4. 5 Level of effectiveness of strategic planning and other indicator of performance

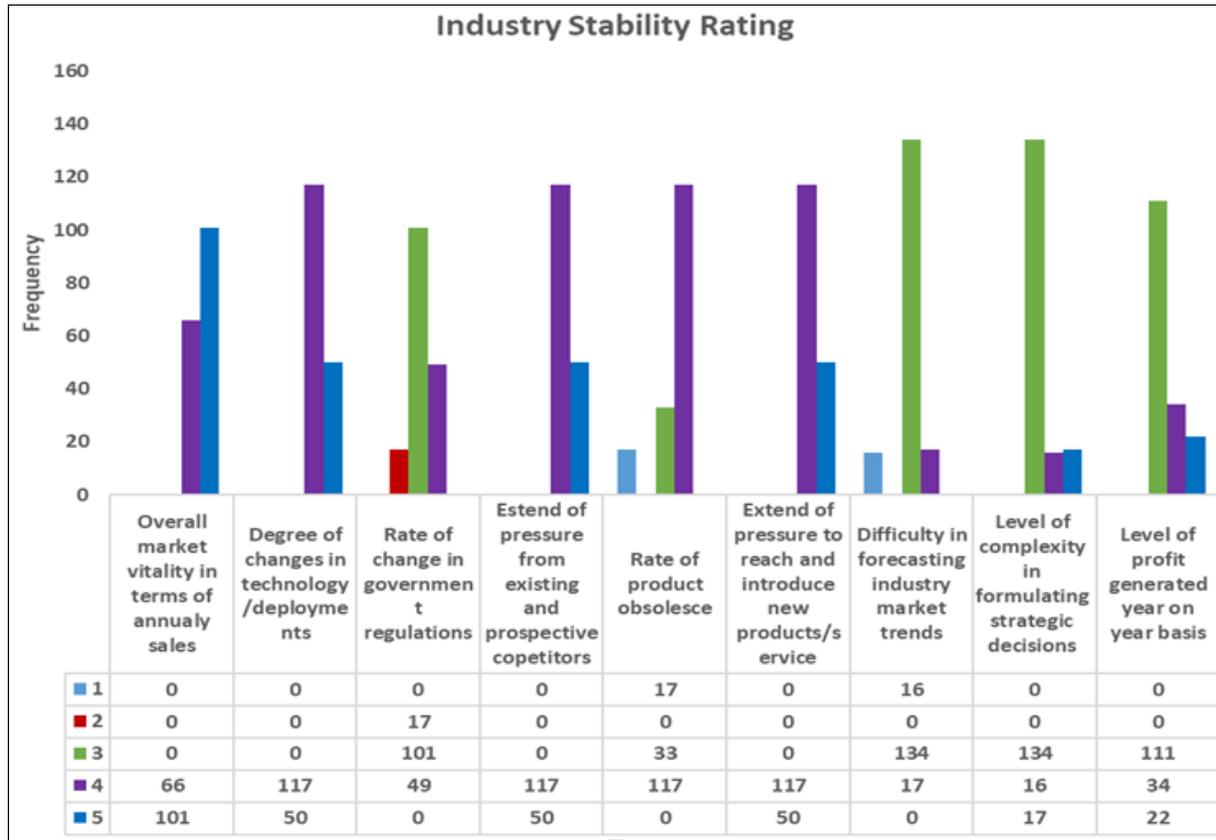


Source: Field survey (2020)

A smaller percentage of respondents selected 'low' for all the other variables except level of satisfaction among top manager where none of the respondent selected 'low' overall feedback on the effectiveness of strategy formulation and level of satisfaction among staff and management was favourable and this ascertain high level of organization performance which later translate in sustainability. The basic elements are to ascertain if market share had decreased, been stable or enhanced and to provide a clue of the degree to which any of these have occurred. There seem to be

challenges with component of data. Even though some MTN operating area (OPA) individual experienced some decline in market share, overall MTN as a firm has seen consistent growth in market share refer to subscribers. The level of growth compares to years before new entrance enter the market has however declined considerable and rightly so due to a new increase of new operators (compactors) in the marketplace (Tigo and Airtel).

Figure 4. 6 Industry stability ratings



Source: Field survey (2020)

Graph 4.6 shows the various responses elicited from respondents base on the different variables and associated ratings. Therefore, based on chart 4.12 we can interpret that MTN Rwanda is stable as result of rating received from respondents where most of criteria from respondents the rate vary from 3 to 5, and 1 is lowest performance and 5 highest performance.

The researcher established the correlation between competitiveness and sustainability in telecommunication industry.

In fact, the researcher wanted to correlate competitiveness (Cost leadership, differentiation and focus, brand strategy, product line and channel of distribution) and sustainability (market share, company turnover and profit, quality of product and customer satisfaction) with the intention to assess a significant or insignificant relationship between indicators of dependent and independent variables.

Table 4.2 Correlation Analysis between Competitiveness and Sustainability in Telecommunication Companies

		Market Share	Companies Turnover and Profit	Quality of Product and Customer Satisfaction
Cost Leadership	Pearson Correlation	.231**	.159**	.174**
	Sig.(2-tailed)	.006	.043	.014
	N	167	167	167
Differentiation and focus	Pearson Correlation	.274**	.187**	.324**
	Sig.(2-tailed)	0.039	0.035	0.032
	N	167	167	167
Brand strategy	Pearson Correlation	.854**	.873**	.750**
	Sig.(2-tailed)	0.018	0.035	0.036
	N	167	167	167
Product Line and Distribution	Pearson Correlation	.878**	.863**	.864**
	Sig.(2-tailed)	0.034	0.017	0.038
	N	167	167	167

***Correlation is significant at the 0.005 level**

Source: Primary Data (2020)

As reflected in Table 4.5, a positive correlation was found between cost leadership and market share ($r=.231^{**}$, $p=0.006$), cost leadership and company turnover and profit ($r=.159^{**}$, $p=0.043$), cost leadership and quality of service and customer satisfaction ($r=.174^{**}$, $p=0.014$). Results demonstrated that a positive correlation between differentiation and market share ($r=.274^{**}$, $p=0.039$), differentiation and company turnover and profit ($r=.187$, $p=0.035$) differentiation and focus and quality of services and customer satisfaction ($r=.324$, $p=0.032$). It was evidenced, a positive correlation between brand strategy and market share ($r=.854^{**}$, $p=0.018$), brand strategy and company turnover and profit ($r=.873^{**}$, $p=0.035$), brand strategy and quality of services and customer satisfaction ($r=.750^{**}$, $p=0.036$). Findings, indicated a positive correlation between product line and channel of distribution and market share ($r=.878^{**}$, $p=0.034$), product line and channel of distribution and company turnover and profit ($r=.863^{**}$, $p=0.017$), product line and channel of distribution and quality of services and customer satisfaction ($r=.864^{**}$, $p=0.038$). All the above, relationship are positively correlated given that the p value was < 0.005 proposing that an enhanced in competitive strategies lead to the company sustainability in telecommunication sector.

V. CONCLUSION

Findings from the first objective lead the researcher to conclude that telecommunication companies are more competitive in the country. This competitiveness emanates from the use of cost leadership, differentiation, and focus, brand strategy, product line and channel of distribution/value chain. Consequently, this stimulates MTN Rwanda to used different adequate tactics to survival and withstand in competition with other telecommunication companies' strategies. Furthermore, taking

into consideration competitive strategies employed by MTN Rwanda.

Conclusion to the second specific objective indicates that a firm that employ competitive strategy remain competitive and adapts to stipulations that positively affect the constant success and profitability. Obviously, this led to the sustainability of MTN. Its sustainability was expressed in the context of its market share achieved, its turnover and profit, quality of product and customer satisfaction.

In light with the third specific objective, the researcher concludes that all independent variables are positively correlated with dependent variable given that the value was < 0.005 proposing that an enhanced in competitive strategies lead to the company sustainability.

ACKNOWLEDGMENTS

I wish to acknowledge Mr Francis MWANGI, Dr. David NYOMBANE and for their contribution to this work from the beginning up to it's the completion. I also wish to extend my acknowledgement to the Mount Kenya University and MTN Rwanda cell authorities for their support and collaborative in term of data collection

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Influence Of Home Environment Factors On Students' Discipline In Public Secondary Schools In Loima Sub-County, Kenya

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DOI: 10.29322/IJSRP.10.09.2020.p10571

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10571>

Abstract- This study sought to investigate the influence of home environment factors on students' discipline in public secondary schools in Loima Sub-county, Kenya. The research questions were: to determine the influence of parenting styles, socioeconomic background of students and education level of parents on students' discipline in public secondary schools in Loima Sub – county. The study was guided by Bandura's Social Learning Theory and utilised causal comparative research design. The study sample was students and deputy principals drawn from 6 public secondary schools in Loima Sub – county. Questionnaires, were used to collect data. Reliability was determined using test-retest method. Data was then analyzed using descriptive statistics such as frequencies and percentages and presented using a table. The results of the study showed that home environment had a significant influence on students' discipline. Based on the findings, the study recommended that parents should be good role models to their children and support schools in matters of discipline for any meaningful improvement in students' discipline to be realized. Principals and schools' Boards of Management were also encouraged to empower the guidance and counselling departments and students' council members through trainings to assist in offering effective alternative mechanisms for arresting and handling discipline issues.

Index Terms- Home Environment Factors, Students' Discipline

I. INTRODUCTION

Home environment refers to the conditions that prevail in a home setting which influences a child's behaviour. The home environment plays a very important role in one's personal growth. Hoffman, Hutchinson and Reiss (2009) suggest that positive social environment has been linked to enhancing students' behaviour, academic achievement, and motivation. It has positive impact on formation of students' behaviour in developing essential skills like making decisions, love for social justice and equality, sensitivity and shaping their discipline (Arifin, Wahab, Teh & Otman, 2018). Human behaviours are shaped by what they experience in the surrounding environment. Therefore, bad and problematic behaviours result from a negative social environment (Ngari,

2014). Hence, the environment is a contributing factor to students' delinquency such as loitering, playing truant, bullying and skipping lessons (Arifin, Wahab, Teh & Otman, 2018). They further note that the students' emotions and minds will easily change according to the environment.

The home environment plays a key role in an individual's initial stages of life. It is the primary agent of socialization and the first "educator" (Perrino, 2011). This is because a child will see the world and life from the perspectives of those that are around him or her (Ngari, 2014). Thus, the most important component of the home environment for students is the family (Azizi Yahaya, 2009). A child will therefore behave in a way that conforms to the norms of the society in which he/she is part of as a way of gaining a sense of belonging.

Wencan, Emiko, Kumi, Etuko, Taeko, and Bailiang (2016) conducted a study in Japan to investigate the influence of home-rearing environment on children's behavioral problems. The study was designed as a 3-year longitudinal study with secondary data. A total of 99 caregivers with preschool aged children were required to complete two self-reported questionnaires: the Index of Child Care Environment and Strengths and Difficulties Questionnaire. It demonstrated that a positive home-rearing environment had a positive influence on children's behavioral problem 3 years' later. The study suggested that behavioural problems in children's later development may be reduced by providing a positive home rearing environment.

Adeboyele and Oyeleye (2016) conducted a study to investigate the home environment and adolescents' sexuality and reproductive behaviour in Ondo Town, Nigeria. Their study examined differences in the sexuality and reproductive behavior of adolescents, and intracity variations in such behavior. The study analysed connections between, socio-economic conditions of families, physical home environment and, sexuality and reproductive behavior of adolescents. The study administered a total of 580 questionnaires to adolescents from high, medium and low residential densities to elicit information on sexuality and reproductive.

School discipline entails all the strategies that can be used to coordinate, regulate and organize individuals and their activities in the school to encourage responsible behaviour and to provide

all students with a satisfying school experience as well as to discourage misconduct. (Ahmad, 2011). Discipline is also regarded as the training especially of the mind and character aimed at producing self-control, ordered behaviour and skilfulness (Wango, 2010). Further, discipline is not only the degree of order and structure in the school (Mukuria, 2002), but also the extent to which the school community views the learner’s behaviour as the appropriate socially accepted conduct (Oplatka & Atias, 2007). Usman (2016) posits that, if discipline is a conscious effort made by an individual to comply with societal rules and regulations, indiscipline is a deliberate calculation made by an individual, persons to disrespect societal rules and regulations. The issue of learners’ misbehaviour in the school environment has evoked concerns among key stakeholders in education provision worldwide (Mwaniki, Kiumi & Ngunjiri, 2018).

In the United States of America, as the level of students’ indiscipline kept growing, state-wide suspension rates in Michigan became high (American Institute for Research, 2017). It further noted that, as a result, the Michigan Department of Education formed the Michigan School Task Force in 2013, to develop a model policy for reducing suspensions and expulsions using alternative discipline strategies.

The greatest challenge facing South African education has been lack of discipline and safety in schools (Maphosa & Shumba, 2010). They further established that school disciplinary problems in South Africa ranged from late coming to drugs and substance abuse. According to Maphosa and Mammen (2011), students were noted for disrespecting authorities, going to school late, fighting among themselves, refusing to do homework and dressing indecently. Some of the students went to the extent of vandalizing school property and assaulting teachers for taking disciplinary action against them or a colleague. Pre – marital sex, armed robbery, drug abuse, drunkenness and smoking of marijuana popularly known as “wee” in Ghana were reported to be prevalent among basic schools in the country (Director – General, Asare, & Twene, 2003).

Research conducted in the United States of America found consistent links between parenting and child behavioural adjustment. For instance, a mother’s parenting behaviours; including the extent to which she displayed affection toward and exerted behavioural and psychological control over her child were linked to later child internalizing and externalizing behaviours (Aunola & Nurmi, 2005). Externalizing, or disruptive, behaviour problems commonly include attention-deficit hyperactivity disorder and conduct problems (Akhter, Hanif, Tariq, & Atta, 2011). These are just a few common behavioural problems that are, in part, shaped by particular styles of parenting. It is widely believed that the delinquent behaviour in most of the juveniles is the result of parent characteristics. Poduthase (2012) argued that adolescents could be led towards delinquent behaviour when they were exposed to lack of intimacy, lack of guidance, lack of parental involvement, lack of parental attachment, anger and blaming. In other words, lack of parental involvement and interaction results in increased risk of violence, primarily in male juveniles (Upitis, Abrami, Brook, & King, 2017).

Behaviour research conducted in Ireland showed that children from impoverished homes developed psychiatric disturbances and maladaptive social functioning at a greater rate than their affluent counterparts did (McCoy, Firck, Loney, & Ellis, 1999). Children

raised in poverty are much less likely to have these crucial needs met than their more affluent peers are and, as a result, are subject to some grave consequences. Deficits in these areas inhibit the production of new brain cells, alter the path of maturation, and rework the healthy neural circuitry in children's brains, thereby undermining emotional and social development and predisposing them to emotional dysfunction (Gunnar, Frenn, Wewerka, & Van Ryzin, 2009; Miller, Seifer, Stroud, Sheinkopf, & Dickstein, 2007).

DeBaryshe, Patterson, and Capaldi (1993) argued that parental education was directly related to styles of parenting and not student's academic performance. In their study, parents with lower educational attainment used coercive strategies for discipline which, in turn, predisposed their children to antisocial and abnormal behaviours. Further, Parveen (2007) found that a parents’ level of education did not significantly affect a child’s emotional stability.

Kenya has also experienced its fair share of indiscipline cases in form of arson, truancy, sexual assault, rape, theft, lateness, bullying, sneaking out of school, fighting, absenteeism, vandalism and drug abuse among others (Waithaka, 2017). In 2016, 126 schools had experienced students’ unrest of different magnitudes in a span of seven months (MOE, 2016). However, the students’ indiscipline went a notch higher in 2017. On 19th July 2017 five female teachers were beaten by pupils at Kirimon Primary School in Samburu County (MOE, 2017). In less than three months after this incident, the students of Lokichoggio Mixed Secondary School in Turkana County experienced the worst horror of their lifetime on 13th October, 2017 when a student who had been suspended sneaked back into the school with his accomplices, killed the school watchman and shot dead five students in the dormitories with 18 sustaining bullet wounds. A number of female students were also raped in this unfortunate case (MOE, 2017). This was preceded by another incident in which two students of Turkwel Boys Secondary School had sneaked into their school laboratory and drank ethanol. One student lost his life while the other lost sight (MOE, 2014). As indiscipline cases persist, it is therefore critical to analyse acts of students’ indiscipline, their root causes, with regard to home environment, in a bid to formulate mitigation strategies.

II. RESULTS

Table1: Frequency Distribution of Students’ Home Environment Factors

Variable	Category	f	%
Parenting style	Authoritative	218	82.58%
	Authoritarian	46	17.42%
	Total	264	100%
Students’ Socioeconomic Background	Poor	212	80.30%
	Middle Class	48	18.18%
	Rich	4	1.52%
	Total	264	100%
Parents’ Level of Education	Degree	12	4.54%
	Diploma	18	6.82%
	Certificate	23	8.71%
	Form Four	28	10.61%

Standard Eight	82	31.06%
None	101	38.26%
Total	264	100%

Information displayed in 1 show that 218 (82.58%) of the respondents who took part in the study had authoritative parents. In most African communities, parents instill discipline and a sense of responsibility to their children at an early age as children spent most of their time with parents and grandparents. This provided parents sufficient opportunity to guide and mentor their children. The finding is in concurrence with Ayiro, Mbagaya and Othuon (2019) who observed that authoritative parenting was the most commonly used form of parenting style in Kenya.

With regard to the occupation of the parents, Table 1 show that 212 (80.30 %) of the students came from poor families. This can be attributed to lack of higher education, which renders most parents unable to secure meaningful employment opportunities. Loima being an arid region is prone to prolonged droughts. This hinders the local community from diversifying their livelihoods through farming. The poverty level is even made worse by livestock raiding among the neighbouring communities which distract people from pursuing stable income opportunities. The finding agrees with the Kenya National Bureau of Statistics Report on Exploring Kenya's Inequality (2013) which reported that more than 79% of Turkana County's population was living in poverty. The information displayed in Table 1 further show that only 4 (1.52%) of the students were from rich families. These students belonged to families whose parents/guardians were involved in meaningful sources of income perhaps like an attractive formal employment or business. These parents/guardians were living closer to the urban areas where one could easily access education leading to alternative livelihood diversification such as securing a job or running a successful business free from raids.

According to the information presented in Table1, Parents with no formal education at all formed the larger category 101 (38.26 %). This means that illiteracy levels were very high among the parents. Since Loima is a pastoralist community, the cultural practice of marrying girls at an early age for wealth hinders their access to basic education as envisaged in the Basic Education Act No. 14 of the Kenyan Parliament. Livestock raiding as a way of obtaining wealth among the males also has a negative effect on their chances of accessing basic education. The high illiteracy levels could also be as a result of lack of established secondary schools; noting that seven out of the existing eight public secondary schools in Loima sub-county were established after the year 2009. Information in Table illustrates a direct variation between illiteracy and poverty levels. The parents without any post-secondary training and below were 211 (79.92%) while the poor parents were 212 (80.30%). This may be due to the fact that a well-paying employment opportunity requires specialization skills attained through post-secondary training. The finding is in line with the Kenya National Bureau of Statistics (2013) which observed that lack of access to essential services like education leads to continued poverty and vulnerability.

III. CONCLUSION

On the basis of the findings of the study, the researcher made the following conclusions;

The discipline of students was greatly influenced by the home environment, more so the parenting styles. Hence, parents played an important role in students' discipline and that discipline in schools would only improve when parents supported the school administration.

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Online Grocery Business Strategy (GBS) – A case study on “Everything Store” the Amazon

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DOI: 10.29322/IJSRP.10.09.2020.p10572

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10572>

I. INTRODUCTION

For the last 6th months most of the nations' across the world have been surviving under a pandemic situation due to Covid 19. Today (18th July 2020) we have read news published by the 'Financial Times' prospering in the pandemic: the top 100, Amazon is one among them. The company anticipates it could spend US\$401.1bn its logistic services during a pandemic situation.

As globe leaders ordered their people indoors, the company became the emergency port of call for those worried to stock up on vital family products — a rush that led the Amazon for the time being shut its warehouses to “non-essential” goods. More focused on supply or sale of the grocery items or necessary commodities. Record revenues followed to the company, but also high costs of operations. Jeff Bezos the CEO of the company warned as much as US\$4bn could be spent on coronavirus mitigation, such as testing labs and thermal cameras — potentially pushing the company into its first quarterly loss since last five years (2015). Still, the increased speed shift to online shopping and the increased significance of its cloud computing business in the remote work era drove the company's stock to all-time highs.

The above paragraph or news as inspired us to develop the case study on Amazon particularly on its 'GBS' during the COVID 19 scenario. In this study, the authors have made an attempt to you to understand historical background and genesis of the Amazon, the company's business strategy formulation process, analysis, implementation, and final remarks have been given. We hope and wish you will enjoy reading this case study and getting knowledge about Amazon's business strategic planning process in particular about its online grocery business.

II. HISTORICAL BACKGROUND AND GENESIS OF AMAZON

'Amazon' is the brainchild of Jeff Bezos becomes a household name in most of the countries across the world today. It was come into existence on 5th July 1994 with initial financial aid of \$245,573 received from his parents as an online marketplace (virtual market) for books selling at Seattle in Washington. Subsequently, it has expanded to sell electronics, software, video, games, apparel, furniture, food and grocery, toys, and jewellery (no clear-cut speciality and selling everything) to compete with its market competitors like Walmart (department store generates

\$514.41 billion in net sales per annum), Alibaba / Aliexpress (as of June 2019, there are 755 million users across worldwide. it is accountable for 58 per cent of all online retail sales in China, and the company sold \$30.8 billion of products as on 13th November 2018), Otto (it has generated roughly \$3.8 billion in revenue from online sales in 2019), JD (Jingdong has more than 305 million on the go customers), eBay (in terms of marketplace website visits, the company is second to Amazon, with just under 20 per cent of the market share), Flipkart (in 2018, Walmart obtained 77 per cent of Flipkart's shares, valuing the company at \$22 billion), Rakuten (it has generated more than \$134 billion in Japanese ecommerce sales alone in 2019), Newegg (44 per cent of Amazon shoppers in the USA have purchased an electronics goods through the platform, obviously, Amazon depends on those sales. Newegg's market share takes billions away from Amazon in this category. The fact that Newegg as a global leader in selling electronics like laptops, TVs, cameras, phones and computer products online is successful in the electronics space is threatening for Amazon).

Amazon is among one of many online stores (no one directly monitors the exact number of electronic commerce websites across the global) with \$232 billion in net sales yearly. Amazon is the most dominant online store in existence today among upwards of 24 million stores (it is estimated figure) selling products on the virtual market today. The other interesting point is Forbes reported in May 2020 that Amazon had surpassed Walmart to become the global largest retailer through its actionable, fact-based tips.

In the USA alone, Amazon holds 45 per cent of the e-commerce market share. That is up from 34 per cent in 2016 and expected to cover 50 per cent by 2021. Every ecommerce store from small niche websites to other retail business giants' owner across the globe needs to face the realism that they are compete with Amazon. It means, in spite of the type of industry and the size of the company, if it sells physical goods online it's up a rival to Amazon. Simply put, Amazon is showing no signs of slowing down any time soon since its incorporation.

Amazon still has a fair split of competitors. For instance, Streaming service 'Netflix' competes with Amazon 'Prime Video' and the 'Google Home' products compete with Amazon's virtual assistant 'Alexa'. In the internet arena, 'Microsoft Azure' and 'Google Cloud' both compete with 'Amazon Web Services' (AWS).

The ecommerce industry is rising at an exponential rate. In fact, retail e-commerce sales worldwide are expected to reach \$4.8 trillion by 2021, Amazon is one among the one.

Amazon is clearly very good at what they do, but due to no-clear-cut speciality and selling everything, in terms of knowledge and quality, they can't vie with smaller niche shops that are specialists in a particular industry. For example, to purchase niche products like bread oil, CBD for pets and vegan cosmetics customers are more likely to buy from the company that specializes in those industries rather to place orders to Amazon. Even though a single online website does not take a huge chunk of Amazon's market share on its own, but every online store is a threat to it by its collective efforts.

The present investment worth of the Amazon is almost \$30 billion – a 12,000,000 per cent on return on investment. Amazon gradually evolved into a MNC and now is worth a \$890 billion (2019). Amazon is the second USA organization cross a trillion dollar valuation next to Apple Company. As on 10th July 2020 the stock price of the Amazon is \$ 3,182.63

III. GBS FORMULATION OF AMAZON

The focal point of strategy formulation of an organization is totally in view to the attainment of its mission and vision statement. The box 1 has shown the Mission and Vision statement of Amazon.

Box1: Amazon's Mission and Vision Statements

The Mission Statement of Amazon

"to be Earth's most customer-centric company, where customers can find and discover anything they might want to buy online, and endeavors to offer its customers the lowest possible prices."

The Vision Statement of Amazon

"Our vision is to be earth's most customer-centric company; to build a place where people can come to find and discover anything they might want to buy online".

Source: <http://panmore.com/amazon-com-inc-vision-statement-mission-statement-analysis>

It has been found that Amazon has a clear, logical, and meaningful vision and mission statements return more than double the numbers in stakeholders benefits when compared to the companies that do not have vision and mission statements. Amazon is a learning organization and intended to more global robust strategy. It may be a top-down or bottom-up strategy, Amazon is more focuses on learning and experienced strategy formulation. It means Amazon is thinking afresh every moment in the formulation of its strategy based on its learning experiences. Amazon wants to formulate its new strategy in response to global challenges and failed strategies. Annual budgeting of the company also plays a vital role in the formulation of its strategy, and the company is critically reviewing its previous strategies. Amazon believes the formal strategic approaches are the most essential way and assesses the outcome of its business cycles quarterly, half-yearly, and annually as the best source to formulate its strategy, however, Amazon is so conscious about to minimize the effect of budgeting though it is included in the strategy formulation process. In our course, we have learned that formulation of strategy processes such as 'War Room', 'Rapid Prototyping', 'Design thinking', and 'Business Model Canvas.' However, like most of

the companies like Amazon, is not totally or truly following the processes or approaches has it is.

Being one of the biggest online business entities I would like to suggest the following approach in the formulation of its strategy.

Create a **War Room** where it could able add more strength in the process of formulation of its strategy Through

Store board- visualize to its strategic members its incremental improvement in its value propositions, in connection with free shipping,

Involvement of organization members: 'Prime' has over 100 million subscribers, making it the most successful loyalty program of all time, and it has is the 800-pound gorilla.



Source: www.amazon.in

Involvement of experts: Amazon believes contemporary technology is the best expert and the company has been more depending on Artificial Intelligence (AI). Amazon has developed an 'Alexa Fund' for startups, targeted at game-changing Artificial Inelegancy investments.

Inputs from diverse perspectives: Amazon is having a strong system in collecting and assimilation of business information from diverse perspectives. Based on CITI outcomes, Amazon's primary geographic expansion target with global future sales 40 per cent of volume, though it has been growing in emerging markets like Asia and the Middle East. All these have been possible only through the company's business inputs from diverse perspectives.

Collaborations: Amazon is the best example of business collaborations. The company always strives to collaborate with others to strengthen its business. One of its recent collaborations is Sugar & Cloth, a lifestyle blog and brand promoted by Rose. It is as similar to Joy Cho's 'Target-exclusive Cheeky' collaboration.

Iteration: The success of Amazon is the step by step approach and strongly believes that innovativeness in Customer Centricity services and strong in Corporate Agility.

Rapid Prototyping

Normally this approach of strategy formulation is quite suitable for manufacturing industry. Amazon, being an online service proving company, always showing in interest on this approach. Amazon has been experimenting this approach in 'online delivery system strategy', 'seller services strategy', and 'customer services strategies'. 'Failing rapidly' is the benefit of

rapid prototyping. With the help this practice, Amazon makes everyone of us for business advice, a startup that quickly dominated its industry and set the standard for very business in just about every industry.

Deign Thinking:

Jeff Bezos, CEO of Amazon has been identified the importance of design thinking and practicing a symmetric approach to creative problem solving. It has made these timeless ideas the foundation for every business he runs, regardless of its industry or the type of product the company offers:

- Business to Business – Amazon Web Services
- For ecommerce business services – Amazon.com
- Participative Media Business– Amazon Prime
- Publishing Business– The Washington Post

The optimization of the approach of ‘design thinking ‘in course of the formulation of strategy has a favor of an iterative, experimental approach for finding best solutions rather than analyzes data for the best possible one.

Business Model Canvas (BMC)

It is the best suggested approach for formulation of strategy a company like Amazon. With the help BMC Amazon could able to focus on Customer demands, competitive strategies, succession strategies (it means flexibility in operative strategies based on market demand), and more transparence. With the support of BMC Amazon prepare the best strategy to cover all the elements of BMC such as Customer segments, Value proposition, Channels, Customer Relationships, Revenue Streams, Key Activities, Key Resources, Key Partnerships, and Cost structure. Table 1 reveals the brief description of all the elements for formulating of Amazon’s BMC.

TABLE 1: BUSIENSS MODEL CANVAS OF AMAZON

Customer segments	Millions of people across the globe have a Prime subscription and pay their fee for its services respectively.
Value proposition	Competitive pricing strategies, selection of products, convenience and fast fulfillment of customers’ orders all carry weightage to Amazon’s value.
Channels	Amazon’s website services (AWS) operates as its prime channel. Dissimilar versions exist on its site that aids and abets customers globally. In these days, apps have been formed to speed up its sales growth. Many affiliates have also taken their role in acting as a channel for Amazon like the AAP (Amazon Affiliate Program)
Customer Relationship s (CR)	‘Amazon’ is a brand that is greatly invested in CR and customer retention. It has enjoyed a healthy and productive CR. Some of their customer interactions take place with the reviews of shoppers can leave on their webpage. Amazon also offers CR service through phone, online chat or email.

Revenue Streams	‘Prime’ remains Amazon’s main revenue stream as it is accessible to more customers and in turn, generates the most revenue for them. Other revenue models include to the company are the Commission and Transaction Fees it makes from its goods as well as the recent sale of electronic books and online content it has been utilizing in its sales.
Key Activities	Amazon’s main activities lead to revenue are as follows: <ol style="list-style-type: none"> 1. Merchandising of its online as well as physical products. 2. Development, design, and optimization of its online platform include a website or app. 3. administer supply chain and logistics 4. Secure and develop a partnership with its items providers and sellers 5. Support the making of movies or show on its prime video platform. 6. Acquire novel ventures to support its ecosystem
Key Resources	Physical resources of the company like fulfillment centers (warehouses), and supply chain automation. Amazon’s technological infrastructure , in particular, is crucial for its everyday business model. The software engineers of the company who are responsible for the creation of its online platform infrastructure. Much of the popular online culture has also served the purposes of the company well where it is used to make attractive sales.
Key Partnerships	The key partners of the company are the Sellers who alone generate the most revenue to the company Other partners include authors, publishers, and logistic part ners increase Amazon’s value and help in the conversion of many people into customers. Amazon values every partner and has many times credited them for their help.
Cost structure	Amazon’s cost structure is determined by value. It means that the company functions on a system that only benefits them economically. Amazon’s IT , and fulfillment centre is also a vital component in this regard as it enables the firm to operate on a worldwide scale. Other vital elements utilized in the cost structure of the company include its customer service centers as well as software development centers across the globe.

Please see the exhibit 1 to know the details of Amazon’s BMC.

IV. AMAZON’S GBS ANALYSIS

“To flawlessly link the digital and brick-and-mortar shopping knowledge in order to be part of every particular purchase made” – it is the main objective of a big online shopping

store's business strategy i.e. Amazon. The goal and strategy clearly state that the company strives to become so embedded in people's lives that they can't imagine living without it.

In recent times Amazon has entered into Grocery shopping. It was observed that the company continues its test, learn and pivot strategy with this category of online shopping and delivery service options. And the company believes that selling groceries to a customer is important to selling them everything else. Here, importantly for the company, the GBS further embeds suppliers' brands into its daily routines.

Amazon's Whole Foods acquisition has allowed the company to experiment with grocery delivery services, offering discounts to Whole Foods shoppers who have an Amazon Prime membership and even selling Amazon devices inside the Whole Foods stores. Future plans call for additional, larger stores with space for more items and online order pickup services.

- a) The GBS presupposes that suppliers brand, quality, price, the popularity of the company, delivery schedule influence on the success of Amazon's grocery business and its strategy.
- b) The underlining assumption takes into consideration of Amazon's 'GBS' is the rate of influence of 'external environment', 'current strategy', and 'internal environment'

As a part of the GBS, the company opened 'Amazon Go' as a pioneer in this category of physical stores where we don't find cashiers or checkout lines. Amazon Go opened after extensive testing with Amazon staff and at present has 10 stores in three cities. Serving ultra-convenience, the store sells grocery items and prepared foods. The store operating by using advanced technology, all the products are thoroughly scanned and customers' accounts are charged (based on value delivery and prices charged proposition) as they leave the store with their items. The effective function of this kind of store(s) is the influence of the Corporate Governance of the company, and the structure of the organization. The current Amazon business strategy is very much supportive to expend its businesses or diversification.

- c) There are nine core assumptions had been examined in the course of 'Amazon's Glossary Business Strategy' and its hypothesis testing?
 1. Amazon's popularity'- the company heads the ranking of the most popular shopping apps in the US with 150.6 million mobile users accessing the Amazon app in September 2019 (Statista, 2019)
 2. 'customers' Trust on Amazon brand'- 89 per cent of buyers agree that they are more likely to buy products from Amazon than other economic sites,
 3. 'its Revenue'- the company brought \$75.5 billion in sales revenue in the first quarter of 2020 (Amazon,2020),
 4. 'The most popular Amazon product category'- the electronics category was the most popular product category purchased by Amazon buyers in the US (44%) (Feedvisor, 2019),
 5. 'The most important factors driving purchasing decision on Amazon'- 82 per

cent of Amazon shoppers say the price is a significant factor to consider when shopping on the platform (Statista, 2019),

6. 'Amazon usage by Device'- 67 per cent of Amazon shoppers prefer to shop using their Personal Computer or Laptop (Cpcstrategy, 2018),
7. 'Number of items sold on Amazon per minute' – on average, small and medium-sized businesses located in the US sell more than 4000 items per minute (as per Amazon 2019),
8. 'Number of Sellers on Amazon' – Amazon has more than 2.5 million sellers presently active selling on the market place (Marketplacepulse, 2019).
9. 'Buyers visit Amazon for inspiration' – 23 per cent of online shoppers go first on Amazon for inspiration when they don't have a particular product in mind for purchase (Episerver, 2019).

Source for 1 to 9 points: www.oberlo.in/blog/amazon-statistics

- d) The hypothesis has been tested based on the assumptions that it was accepted. A future element of the Amazon GBS includes additional locations, possibly in airports. Other competitive retailers of Amazon, including 'Kroger' and 'Walmart', are watching closely, with many eager to tap into the technology that lets customers purchase items without waiting in a checkout line.

V. AMAZON'S GBS IMPLEMENTATION

Now the authors try to understand Amazon GBS implementation based on applying the 4A model. Through this model, the authors made an attempt to identify issues and describing what would be needed to happen for it to be achieved in terms of

- i. Whether Amazon has aligned (**alignment**) externally, internally, and in leadership?
- ii. Does Amazon have the **ability** to implement the strategy?
- iii. Is the company's **Architecture** in place to drive to performance?
- iv. The '**Agility**' (responsive and nimble) of the Company.

The observations of 'the GBS' implementation of the company based on the above-cited 4A model elements have been given below:

1. Amazon with its online business networks in terms of shoppers, sellers, financial and logistic services providers, technology and the committed leadership support don't face any notable issues in a step by step implementation of its 'Glossary Business strategy.' Particularly in grocery business 'Amazon' is

concentrating towards identifying the customers' needs based on their culture, food habits, purchasing quantity, preference of quality, pricing of items, order processing time, stores identification, in time delivery and its tracing system etc are strongly supported the company for the success of the strategy implementation. Amazon is always using easy to place order system which is user friendly and gives good direction to the customers in place and tracking their orders.

2. Amazon has shown its 100 per cent ability in the implementation of this strategy. The justification of the statement is based on 'Amazon's effective Management Information System' which do not allow to deviate from 'meeting needs of customers', 'incorporate data analysis in its decision making', 'constant learning about customers, for example as shoppers search and add goods to their cart, behavioural data shows trends that identify grocery items preferences and buying behaviours', 'building a community for its customers- which is necessary in case of the grocery business, as per research reports 87 per cent of customers prefer grocery feedback from people they know and trust versus brands', 'building a loyalty program to intensive customers – in 2015, the company was launched 'Amazon Prime Day' though this 'for one day only' Amazon Prime members have access to deep discounts and exclusive offers', and to grow as a result of its dedication to trying new things- feathers like grocery items reordering and returning damaged items. These are in addition to required resources, time and other factors such as risk-taking, financing, understanding of government policies and procedures support to the company.
3. 'Amazon Echo has grown to the point it makes up 75 per cent of the worldwide smart speaker market and stood in 1st rank among world smart speaker market in the III Quarter 2018' – I coated this statement to make us understand that 'the company's optimization of 'architecture' in place to drive to perform the strategy. The company is operating its 'grocery' business with 30 data centres in its worldwide network at about 600 megawatts of Information Technology. Amazon wants to penetrate its 'grocery' business through its strategy wants to use the services of its AWS (Amazon Web Services – www.aws.com) worldwide cloud infrastructure. It is most secure, widespread and dependable cloud platform providing over 175 completely featured services from all the 30 data centres worldwide. The AWS has the huge and most dynamic ecosystem ready to serve Amazon's millions of active customers and tens of thousands of partners worldwide.
4. Amazon becomes the synonyms of the word 'Agility.' The company has been showing its consistent responsiveness towards each one of its customers towards his/her needs the price versus value delivery, items quality, packing, and delivery, merchandising, self ability to mould to meet the present market demands.

VI. CONCLUSION

With this attempt of developing this case study on 'online GBS of Amazon' would make us understand there is a thread which connects a strategy formulation, analysis, and implementation. A strong synchronization among these three plays a vital role in the success of any strategy. The management of Amazon is having the keen and in depth knowledge to study the global business environment, the impact macro business environment on online business in general and on online grocery business in particular. Amazon has also the skill to turn the panic environment situation as favourable to its business. Initially, a strategist or a company should analyze the need and purpose of a specific strategy based on his/her/its demands. Amazon has needed a business strategy of its online business to serve its customers in better a manner, business sustainability, consistent growth, profitability, and finally face the global competition for full filling its 'mission and vision statement and further grade up its online grocery business. The major pillar of a strategy formulation is the organizations 'mission and vision statements' Amazon is fully understood this and one can easily notice this by study its business strategies. The outcome of our study clearly states that Amazon's strategy formulation confined to its mission and vision statements. It was found that the BMC play a significant role in Amazon's strategy formulation rather than other elements in the course of strategy formulation. The formulated strategy of the company has been thoroughly analyzed based the Amazon's Strengths and Opportunities. The authors took the help of the 4A model to study the issues in the implementation of the strategy and found that Amazon got to succeed in the implementation of its strategy without any deviations.

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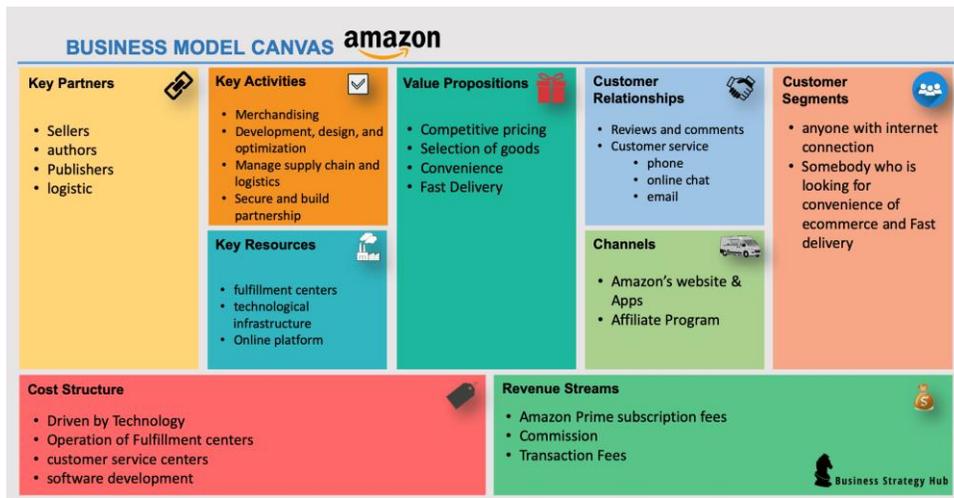
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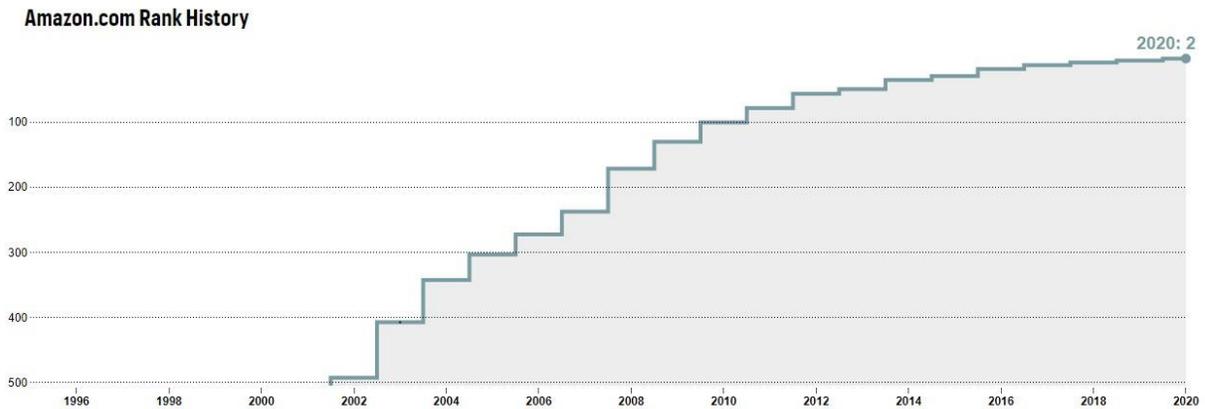
EXHIBITS AND CITATIONS

Exhibit 1: Amazon’s Business Model Canvas



Source: <https://bstrategyhub.com/how-does-amazon-makes-money/>

Last visited on 17th July 2000



Graph 1: A Graphical representation of the intensifying growing of Ranking of the Amazon (presented by the magazine Fortune 500)

Source: 1) Fortune, 2) <https://www.greyb.com/amazon-business-strategy/> last visited on 17th July 2020

Amazon ranked 8th on Fortune 500 companies 2018 list, 5th in its 2019 list , and claimed 2nd in 2020 list – It’s the best rank ever since Amazon made its presence in the magazine for the 1st time in 2002. Since then, Amazon has been continuously listed on the coveted list, each time with a rank better than the previous year.

Assessing The Attitude Of Mothers Towards Family Life Education Of Their Adolescents In Ilishan Remo, Ogun State, Nigeria

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DOI: 10.29322/IJSRP.10.09.2020.p10573

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10573>

Abstract- Background: Family life education (FLE) is an essential education that children born into a home must undergo before reaching adulthood. Adolescents resort to illicit behaviours because they lack the knowledge of family life education. The mother has a great role to play in imparting this knowledge and skills and if properly inculcated into the adolescents, the act of too early initiation of sexual activity, premarital sex, teenage pregnancy, unsafe abortion leading to destruction of reproductive organs, dumping and abandoning babies by the way side and refuse bin and contracting sexually transmitted infections will abate. The attitude of mothers towards family life education of adolescents was assessed in this study.

Materials and Methods: A descriptive survey design was used for this study to assess attitude of mothers towards family life education of their adolescents and 183 consenting mothers were recruited from in Ilishan Remo, Ogun State for this study. A self-structured questionnaire was administered to obtain sociodemographic characteristics, assess attitude of the mothers towards imparting family life education and also assess the hindrances to imparting family life education among the study participants. Questionnaire was validated, Cronbach alpha reliability coefficient was 0.81. Mothers' attitude were assessed with the use of 13 questions and some of the factors that hinder the mothers from imparting family life education were assessed with the use of 6 questions on a Likert scale of strongly agree to strongly disagree. Data gotten from questionnaire was collated and analyzed in frequencies and percentages using Statistical Package for social sciences (SPSS) version 21 and the hypothesis was analyzed with crosstab chi-square. Statistical significance was set at $p < 0.05$.

Results: Study participants comprised 183 mothers from Ilishan-Remo, with majority of study participants aged 31-40 years (50.3%). The highest level of education of the mothers was tertiary education 110(60.0%). The mothers had a poor attitude towards imparting family life education to their children as 50.3% do not feel comfortable teaching family life education, 72.2% have never discussed with their children because they do not have the time to discuss family life education with their children, 68.3% have never discussed because they feel their children are too young to understand family life education while 64.5% have never discussed with their children because they feel the knowledge of family life education may expose their children to immorality. The null hypothesis was accepted as it revealed no significant

difference between mother's attitude and how they impart family life education to their children with a *p-value* is 0.086.

Conclusion: Mothers' attitude was revealed to be negative from the study and they some encountered difficulties imparting family life education to their adolescents. Mothers need to develop a positive attitude towards imparting family life education and should also create time for their children to gain their confidence so they can feel free to talk to them on any issue bothering them. Mothers need to be encouraged on matters concerning family life education through community outreach, seminars and workshops in churches and even in the market.

Index Terms- Adolescent, Attitude, Family life education, Mothers

I. INTRODUCTION

Adolescence is a powerful formative time of transition to adulthood. Young people all over the world are potential of a country's future, and if their needs, particularly sexual reproductive health needs are not addressed, they have the real potential to jeopardize their future (Adesokan, 2014). Family life education is an essential education any child deserves from his/her home to avert the problems that come with lack of such education. The parents, particularly mothers have enormous role to play in this regard since the home is the child's first school of socialization, such roles as rearing, nurturing, educating the child on the acceptable moral values and exposing the child to what sexuality is all about is very paramount (Okoroafor & Njoku, 2012).

Lack of proper knowledge of FLE puts the adolescent at greater risk for teenage pregnancy, unsafe abortion, sexually transmitted infections, HIV infection or health problems related to pregnancy and child bearing, too early initiation of sexual activity, sexual intercourse without the use of contraceptive, sexual intercourse without condom, sexual intercourse with more than one partner, probably sexual intercourse with a partner infected with an STI and/or HIV/AIDS and stands a risk of dropping out of school (Adesokan, 2014). These practices by the adolescents which are on the increase in our society today shows there is a gap in the early upbringing and training of the adolescents suggesting that there is an education that was probably left out.

The mother's attitude towards teaching family life education is an emotional response that expresses different degrees of acceptance and rejection, in sum total, the attitude of mothers determines the success of the teaching of family life education. The type of attitude formed by mothers can be negative or positive. [Odimegwu, Bamisile & Okemgbo₂ \(2017\)](#) stated that positive attitude towards the teaching of family life education will lead to the avoidance of premarital sexual intercourse while on the other hand negative attitude will lead to several risky behaviour especially sexual and their complications. [Inioluwa \(2017\)](#) also stated that sexual attitude, like other attitude which generally result from frustration, are derived from unexpressed and often unconscious premises and imaginative thoughts of the adolescents which are always articulate and precise resulting in experimentation. Inadequate information about sex has led to the mothers forming a negative attitude about family life sexuality education.

[Bankole, Adewole, Hussain, Awolude, Singh and Akinyemi, \(2015\)](#).stated that over 70% youths (girls) in Africa become pregnant between the ages of 15-19 years and in Nigeria so many girls aborted in schools. In a survey conducted by [Mmari, Kalamar, Brahmhatt, and Venables, \(2016\)](#), on the Influence of the Family on Adolescent Sexual Experience: A Comparison between Baltimore and Johannesburg., findings revealed that lack of parental presence was perceived to result in adolescents feeling an overall lack of adult support and guidance and that Young adolescents were often left to raise themselves and their younger siblings, even if they were living with their parents showing lack of emotional support.

According to National academic press (2016), a parent could face certain challenges that may be a hindrance to imparting family life education. Some of these factors can be; (i) Ignorance as most illiterate mothers find it difficult to discuss sexual matters. They feel that one needs to grow to adulthood before hearing about sex. Some mothers think that someone who has not married should not know the thing peculiar to men and women. (ii) Culture can affect effective teaching of family life education especially for parents who give away their girl child too early to marriage. (iii) Divorce: when a mother is a single mother, sometimes she lacks emotional balance to impart family life education. (iv) Communication pattern/attitude: having the knowledge of family life education is good but another issue is the mother's attitude in trying to impart this knowledge. (v) Time: mothers of these days hardly spend their quality time with their children, this could be attributed largely to quest for knowledge and degrees and then to improve the financial state of the family, consequently a mother sometimes move out very early for work and return late and has no time to spend with her kids. Even when she does, she's in a hurry.

Mothers are duty bound to give more detailed explanation about sex and sexuality to their children because children naturally tend to confide in their mothers, this relationship of trust, friendship and confidence which have started in early first year of life that the mother should take advantage of in discussing sexuality with their children. Mothers should help their children understand the stages of physical and psychological developments of the genital organ, and should not allow them get this information from friends and people who are not well informed. Therefore the main objective of this study is to assess the attitude

of mothers towards family life education of their adolescent children in Ilishan-Remo, Ogun State.

II. OBJECTIVE OF THE STUDY

The objective of this study was to **assess** the attitude of mothers about family life education of their children and to find out the mothers major hindrances to teaching family life education.

Research questions

1. What is the attitude of mothers about imparting family life education to their children?
2. What is the mother's major hindrances to teaching family life education?

Hypotheses

There is no significant difference between the mother's attitude and how they impart family life education to their children.

III. MATERIAL AND METHODS

This study utilized a descriptive design to assess the attitude of mothers towards family life education of their children in Ilishan-Remo, Ikenne Local Government Area of Ogun State after obtaining ethical approval from Babcock University Health Research Ethics Committee (BUREC). Permission to carry out the study was also sought and obtained from the church/mosque leaders in Ilishan. Mothers were selected from different denominations, a total of 183 mothers participated in the study after obtaining a written informed consent.

Study design: Descriptive survey design

Study Location: The location for this study was Ilishan-Remo Community in Ikenne Local Government Area of Ogun state, Nigeria.

Sample size: 183 mothers attending churches and mosque

Sample size calculation: The sample size for this study was estimated based on a single proportion design. The target population of mothers were 336. A confidence interval of 5% was assumed. The sample size obtained for this study was 183 participants.

Subjects and selection method: The study participants were selected using multistage sampling technique to ensure that all denominations in Ilishan-Remo were represented during the study. A proportionate sampling technique was used determine the number of churches and mosque to be selected while simple random sampling technique was used to select the mothers from the 8 churches and purposive sampling technique was used to select participants from the central mosque (where a large number of them gather 2pm on Fridays)

Inclusion criteria:

Mothers who have children between the ages of 10 and 19
 Mothers resident in Ilishan
 Mothers who attend churches and mosque
Exclusion criteria:
 Mothers not willing to give consent
 Mothers who do not have children between the ages of 10 and 19

Instrumentation

A self-developed questionnaire was used to collect data for the study. The questionnaire comprised of three sections
 Section A: Socio- Demographic data of the respondents
 Section B contains 13 questions to assess the mother’s attitude towards family life education of their children. This was done using a 5 point Likert scale ranging from strongly agree to strongly disagree.

Section C contains 6 questions to find out the factors hindering mothers from teaching family life education to their children using a 5 point Likert scale ranging from strongly agree to strongly disagree.

Validity and Reliability of instrument

The instrument was validated through expert observation by the researcher’s supervisor and other school faculty to ensure the content validity and to eliminate ambiguity. Reliability was done by pretest using 18 mothers from pioneer church, Babcock. Cronbach alpha coefficient was found to be 0.81 which was considered reliable.

Procedure

Ethical clearance was obtained from Babcock University Health Research and Ethics Committee (BUHREC) and a letter from school of nursing, Babcock university was given to the church/mosque leader and women leaders to gain their permission and entrance into their midst. Explanations were given to the mothers, participation was voluntary and they were assured that every information they will supply will be handled as confidential. The questionnaire was administered face-to-face to the respondents and the researchers used a research assistant to translate the questionnaire into Yoruba language to facilitate understanding of those who can only speak Yoruba. The questionnaire was distributed to respondents at different date and time and same collected on the spot.

Data analysis

Data gathered from the respondents was assessed for completeness, coded and analyzed using Statistical Package for Social Science (SPSS, version 21). Descriptive statistics (frequency tables and percentages) was used to describe participants’ demographic characteristics and answer the research questions asked. Hypothesis was tested using inferential statistics (crosstab chi-square)

IV. RESULTS

The primary sources of data for this study was obtained through the administration of questionnaires to 183 mothers, same were collected back from the participants that were involved in the study giving 100% response rate.

Table no. 1 below shows the sociodemographic characteristics of study participants. The study participants comprised of 183 participants, 92 (50.3%) were within age group 31-40yrs, followed by 55(30.1%) fall within age group 41-50 years, 23(12.6%) fall within age group 51-60 years while the least happened to be 13(7.1%) fall within age group above 60 years . Almost all the respondents 131 (71.6%) were Christians, 51(27.9%) were Islam while 1(0.5%) were other religion. Majority of the respondents’ occupation 78(42.6%) are trading, 46(25.1%) are teaching, 30(16.4%) are house wife, 20(10.9%) are fashion designer while 9(4.9%) are catering. 152(83.1%) are major respondents that had 1 – 4 children, 29(15.8%) had 5 -8 children while 2(1.1%) had 9-12 children. Majority of the respondents 160(87.4%) are from monogamy marriage while 23(12.6%) are from polygamy marriage. Most of the Educational level of the respondents 110(60.1%) are in tertiary, 47(25.7%) are in secondary, 14(7.7%) are in primary while 12(6.6%) are not in any educational level. The most of the tribe of the respondents 142(77.6%) are Yoruba, 28(15.3%) are Igbo, 7(3.8%) are from others tribe while 6(3.3%) are from Hausa’s tribe.

Table 1: Sociodemographic characteristics of study participants

Variables	Frequency (N = 183)	Percentages (%)
Age		
31 - 40 years	92	50.3
41 - 50 years	55	30.1
51 -60 years	23	12.6
Above 60 years	13	7.1
Religion		
Christianity	131	71.6
Islam	51	27.9
Others	1	.5
Occupation		
House wife	30	16.4
Trading	78	42.6
Teaching	46	25.1
Catering	9	4.9
Fashion designer	20	10.9
Number of children		
1 -4	152	83.1
5 -8	29	15.8
9 -12	2	1.1
Type of marriage		
Monogamy	160	87.4
Polygamy	23	12.6
Educational level		
No education	12	6.6
Primary	14	7.7
Secondary	47	25.7
Tertiary	110	60.1
Tribe		
Yoruba	142	77.6
Igbo	28	15.3

Hausa	6	3.3
Others	7	3.8

their children are too small to understand family life education. 124(64.5%) agreed they have never discussed with their children because it may expose my children to immorality, 111(60.0%) do not encourage teaching family life education, 90 (49.1%) do not feel family life education will enlighten their children about acts of life, 123(67.2) strongly feel family life education will encourage their children to explore their body and experiment sex while 93(50.8%) do not believe family life education provides opportunity for proper counselling for their children.

Table 2 below shows the attitude of the mothers about imparting family life education, 92(50.3%) do not feel comfortable teaching family life education, 22(12% were undecided), 83(45.4%) have not discussed the sex topic with their children, 49(26.8%) were undecided), 132 (72.2%) agreed they do not have time to discuss family life education with their children. 125 (68.1%) actually feel

Table 2. Showing the attitude of mothers towards family life education of their children

Respondent's attitude scale	SA	A	U	D	SD
I feel comfortable teaching family life education to my children	30(16.4%)	39(21.3%)	22(12.0%)	9(4.9%)	83(45.4%)
I discuss with my children sex topic	21(11.5%)	30(16.4%)	49(26.8%)	10(5.5%)	73(39.9%)
I discuss with my children menstruation/wet dreams topic	23(12.6%)	31(16.9%)	43(23.5%)	3(1.6%)	83(45.4%)
I discuss with my children relationship with opposite sex topic	34(18.6%)	25(13.7%)	41(22.4%)	8(4.4%)	75(41.0%)
I have never discussed with my children because I don't have time to discuss family life education	96(52.5%)	36(19.7%)	25(13.7%)	10(5.5%)	16(8.7%)
I have never discussed with my children because my children are too young to understand family life education	88(48.1%)	37(20.2%)	29(15.8%)	19(10.4%)	10(5.5%)
I have never discussed with my children because it is a taboo, that should not be discussed until shortly before marriage	8(4.4%)	11(6.0%)	31(16.9%)	36(19.7%)	97(53.0%)
I have never discussed with my children because it may expose my children to immorality	77(42.1%)	41(22.4%)	23(12.6%)	25(13.7%)	17(9.3%)
Teaching of family life education is something I always encourage	50(27.3%)	11(6.0%)	11(6.0%)	54(29.5%)	57(31.1%)
Teaching of family life education is good because it enlightens children about facts of life	53(29.0%)	38(20.8%)	2(1.1%)	3(1.6%)	87(47.5%)
Family life education encourages exploring the body and experimenting sex	100(54.6%)	23(12.6%)	11(6.0%)	21(11.5%)	28(15.3%)
Teaching of family life education is good because it gives a person the opportunity to correct misconception about the subject matter	38(20.4%)	48(26.2%)	5(2.7%)	7(3.8%)	85(46.4%)
Teaching of sex education provides opportunity for proper counseling for my children	48(26.2%)	37(20.2%)	5(2.7%)	9(4.9%)	84(45.9%)

Table 3 below shows the factors that hinder mothers in Ilshian-Remo from teaching family life education to their children, 57(31.1% had no idea of what family life education is. It is very interesting to note that 155(84.7%) indicated that teaching of family life education is not a taboo in their culture and 161(88%) indicated their religion do not forbid the teaching of family life education to their children. However 134(73.2%) said they do not really have the time to discuss family life education with their children, 139 (75.9%) indicated it is embarrassing to discuss with their girls while 139(76%) also indicated it is embarrassing to discuss with their boys.

Table 3 Showing the factor that hinder mothers from teaching family life education

Factors that hinder	SA	A	U	D	SD
I have no idea of what family life education is	22(12.0%)	35(19.1%)	2(1.1%)	40(21.9%)	84(45.9%)
It is a taboo to speak about family life education in my culture	6(3.3%)	12(6.6%)	10(5.5%)	73(39.9%)	82(44.8%)
My religion forbids it	5(2.7%)	7(3.8%)	10(5.5%)	66(36.1%)	95(51.9%)
I don't really have the time to discuss with my children	69(37.7%)	65(35.5%)	15(8.2%)	24(13.1%)	10(5.5%)

It is embarrassing to discuss with my girls	72(39.3%)	67(36.6%)	13(12.6%)	8(4.4%)	23(12.6%)
It is embarrassing to discuss with my boys	71(38.8%)	68(37.2%)	13(7.1%)	21(11.5%)	10(5.5%)

Hypothesis testing

Table 4 showing area of discussion about family life education, the differences in the Mother’s attitude and how they impart family life education to their children.

Mother’s attitude	Area they have discussed with their children						χ^2	p-value
	Not at all	Dating	Reproduction	Menstruation/ Wet dream	Sexual experience	Relationship with opposite sex		
Good	17	1	1	7	3	13		
Bad	40	8	8	20	11	54	222.50	0.086
Total	57	9	9	27	14	67		

The hypothesis revealed that there is no significant difference between mother’s attitude and how they impart family life education to their children. The result from above table showed that the p-value is 0.086. Therefore the null hypothesis was accepted.

V. DISCUSSION OF FINDINGS

Family life education (FLE) is an organized effort to enrich and improve the quality of individual and family life by providing people with information, skills, experiences and resources intended to strengthen, improve, or enrich their family experience. “Family life education focuses on healthy family functioning within a family systems perspective and provides a primarily preventive approach to health and wellbeing. The skills and knowledge needed for healthy functioning are widely known: strong communication skills, knowledge of typical human development, good decision-making skills, positive self-esteem, and healthy interpersonal relationships. The goal of family life education is to teach and foster this knowledge and these skills to enable individuals and families to function optimally” (National Council on Family Relations, 2014).

A majority of the respondents, 92 (50.3%) and 55(30.1%), are in age groups 31-40years and 41-50years respectively. Almost all the respondents 131 (71.6%) were Christians, 51(27.9%) were Muslims while the remaining 1(0.5%) were identified as other religion this is due that majority living in the part of the study religion are Christians. A large number 78(42.6%) are traders, 46(25.1%) are teachers, 30(16.4%) are house wife, 20(10.9%) are fashion designer while 9(4.9%) are caterers. This is expected in a study carried out in a community whose major occupation is trading and teaching. In term of number of children respondents had, majority 152(83.1%) had 1 – 4 children, 29(15.8%) had 5 -8 children while 2(1.1%) had 9-12 children. A significant number 160(87.4%) are from monogamy marriage while 23(12.6%) are from polygamy marriage. Majority of the respondents educational qualification 110(60.1%) are in tertiary, 47(25.7%) are in secondary, 14(7.7%) are in primary while 12(6.6%) are not in any educational level This is understandable for a study carried out in the south-west part of the country and a community whose major reason why we have more Yorubas participating in the study.

The attitude of mothers about imparting family life education to their children as revealed in this study clearly shows that mothers have a negative attitude about imparting family life education to their children because they don’t feel comfortable teaching family life education to their children or discussing with their children such topics as menstruation/wet dreams, sexual experience, dating. The mothers also reported they do not have time to discuss with their children, this implies that parents especially mothers who ought to be the primary sexuality educators to their children fall short because they do not spend adequate time with their children and children naturally relate better with people they spend more time with. Lack of adequate with one’s mothers may lead into learning values/morals which are against the family and the parent/mother may not always be around to monitor, supervise and correct risky values/morals, furthermore, mothers do not have patience even when they are around to really understand and relate well with their children and gain their confidence and approval Furthermore in this study, the mothers feel their children are too young to understand issues on family life education. Interestingly, it is not a taboo in their culture, neither do their religion forbid, but they feel that it will expose them to sexual immorality. Lebens (2010) revealed that sexual myths and ignorance have placed parents in a state of dilemma, making them to feel uncomfortable to discuss sexuality matters with their adolescents.

The mother’s major hindrances to teaching family life education was revealed in the study. Findings are that there are certain factors that hinder mothers from teaching family life education to their children, 31.1% had no knowledge of what family life education is while 56.3% had little knowledge about family life education. It is very interesting to note that 84.7% indicated that teaching of family life education is not a taboo in their culture and 88% indicated their religion do not forbid the teaching of family life education to their children. However 73.2% said they do not really have the time to discuss family life

education with their children, 75.9% indicated it is embarrassing to discuss with their girls while 76% indicated it is embarrassing to discuss with their boys. Aniebue (2012), in his study of the knowledge and attitude of secondary school teachers in Enugu to school based sex education, he identified that parents 48.9% and teachers 30.6% were the most appropriate individuals to provide information about sex to young people, but it has been reported that many parents do not and are not able to provide their children with adequate sex education. Ohia (2016), reported about the mother's attitude to giving sexuality education as a check to sexual abuse of primary school girl, the researcher found out that many mothers themselves do not know what constitutes the teaching of sexuality education. This may be due to the culture of silence on sexuality and sex related matters and the myth that sexuality is equivalent to intercourse.

VI. CONCLUSION

In conclusion, this study revealed that mothers in Ilishan-Remo knowledge have a negative attitude towards imparting family life education to their children

VII. RECOMMENDATION

Based on the result from this study, the researcher made the following recommendations:

- 1) Mothers need to develop a positive attitude towards family life education
- 2) Mothers should create time for their children to gain their confidence and make their children feel free to talk to them on any issue bothering them.
- 3) Mothers should start early to talk to their children about family life education.
- 4) Most importantly, health care workers should double their efforts in seminars and workshops on family life education that will involve the mothers

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Monitoring of Drinking Water quality in Regional Laboratory Gombe Nigeria

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DOI: 10.29322/IJSRP.10.09.2020.p10574

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10574>

ABSTRACT: Drinking Water Quality control by the Regional laboratory Gombe Nigeria was investigated. The aim of this study is to investigate the quality of analysis done in drinking water control in the regional laboratory in terms of the kinds of analytical instruments used, the technology employed for the control and the kind of contaminants analyzed. Four analyses were carried out between June to December 2008 for four different samples. For each sample, 25 parameters were tested. The results obtained were analyzed using the Nigerian Drinking water standards. The results showed good agreements with the Nigerian standards, 90% of the results values were much below the maximum allowed limits. Nevertheless, good as the result may look there are many parameters that are not measured by this laboratory. In the Nigerian Drinking water standards there are so many inorganic parameters with very low maximum allowed limits, parameters like Arsenic with 0.01mg/l, cyanide 0.01mg/l, lead 0.01mg/l, etc. These low limits show how important it is to make sure such pollutants are not found in drinking water, but most of them are not been tested in the research laboratory. Therefore, if these pollutants were found in the water in this region, consumed by human beings and animals it would be to the detriment of their health. The results of this study showed that, the regional laboratory Gombe meets the Nigerian maximum allowed limits to a large extent but need to test for some vital contaminants that pose as health risk in drinking water if present even at a very low concentration. The analytical instruments used in this regional laboratory are simple basic instruments and some tests were not carried out for lack of more robust and reliable analytical instruments.

Key words; water quality, contaminants, drinking water standards, parameters.

INTRODUCTION

The regional laboratory in Gombe is one of the four regional laboratories established by the Federal Ministry of Water Resources. The aim of these laboratories is to monitor pollution in these regions of the country, pollutions due to human and industrial activities. They are also to carry out quality control in the regions, for both raw and portable water. They are expected also to periodically monitor drinking water to ensure the treated water meets specifications. Gombe regional laboratory is responsible for monitoring pollution in about eleven states. One outstanding industry in this region is Savannah Sugar Company, which produced a lot of effluent that require treatment before being disposed into any water body; the regional laboratory monitors their effluent periodically. For any successful monitoring and policing of environmental pollution, excellent methods and instruments for assessment are needed. Therefore the aim of this study is to investigate in detail the methods and instruments used in Gombe regional laboratory to monitor water quality in the region. The kind of contaminants analyzed or not analyzed was examined and results compared with the Nigerian drinking water standard to see how good and efficient the water quality control is being done in the regional laboratory.

MATERIALS AND METHODS

The water samples were collected directly from sources in Gombe and analyzed by the laboratory staff the same day. Methods used for analysis were: Color Filtration, Sensory Organs, Thermometer, pH Meter, Conductivity meter, Turbidity meter, Dissolved Oxygen (DO) Meter, Diethyl-p-Phenylendiamine (DPD) Method, Nitra Ver 5 Reagent Powder Pillow (RPP), Nitri Ver 2 RPP, Sulfa Ver 4 RPP, Phos Ver 3 RPP, Spands method, Calmagite, Ascorbic acid, Ferro Mo/DR890, Oxidation, Comparison, and Membrane filtration. These results were collected and analyzed by comparison with the Nigerian standard for drinking water.

RESULTS AND DISCUSSION

The results obtained in the regional laboratory Gombe are showed in Table 1 to 2 below

Comparing this with the standard, the results are mostly below the standard. But looking at the contaminants analyzed, it can be seen that only few contaminants are analyzed compared for example with contaminants given in WHO drinking water standard or that of some developed countries, a comprehensive comparison has already been described (Danja, 2010). The reason for failure to analyze many contaminants is lack of analytical instruments. The common analytical instruments found in this laboratory are basic ones like pH meter, conductivity meter, total solid meter, turbidity meter. Some few standard instruments were found in the laboratory, examples are spectrophotometer, gas chromatography, flame photometer, etc, but they were not in used. A critical component of environmental monitoring especially for drinking water quality control is the type of analytical instruments used to analyze samples. Normally the choice of these analytical instruments is dictated by the environment monitored, the parameters of interest and the data quality requirements; one must therefore select a scientifically sound method, approved by a regulatory agency. Gombe regional laboratory just use instruments that are available and not so much dictated by the regulatory agency nor the environment or parameters to be monitored (Danja, 2010). This is an unfortunate situation because analytical measurements are the foundation for determining pollutants and their effects in the environment and to ultimately formulate appropriate risk management policies and laws, therefore analytical instruments should be chosen carefully following procedures described in literature (Gillian, 2007).

Table 1 Water Quality Analytical Results from Gombe Regional Laboratory

Parameter	Unit	Method used	Result 29.06.08	Result 15.07.08	Nigeria STD.	Remarks
Appearance	-	Visual	Clear	Clear	Un-Obj	O.K
Color	Pt-co	Color Filtration	0.0	30.0	15.0	Not OK
Odor	NT	Sensory Organs	Un-Obj	Un-Obj	Un-Obj	O.K
Taste	-	Sensory Organs	Un-Obj	Un-Obj	Un-Obj	O.K
Temperature	O ^c	Thermometer	29.8	28.8	Ambient	O.K
PH-Value	pH	pH Meter	7.35	6.65	6.5 -8.5	O.K
Conductivity	μS/cm	Conductivity meter	180	440	1000	O.K
Turbidity	NTU	Turbidity meter	11.29	13.70	5.0	Not O.K
TDS	Mg/l	Conductivity meter	90.0	220	500	O.K
DO	Mg/l	DO Meter	4.36	0.85	7.0	O.K
Chlorine (Free)	Mg/l	DPD Method	-	-	0.25	-
Chloride	Mg/l	DPD Method	-	-	250	-
Nitrate (NO ₃)	Mg/l	Nitra Ver 5 RPP	22.3	24.30	50	O.K
Nitrite (NO ₂)	Mg/l	Nitri Ver 2 RPP	-	-	0.2	-
Sulfate (SO ₄)	Mg/l	Sulfa Ver 4 RPP	33.0	15.0	100	O.K
Phosphate(PO ₄)	Mg/l	Phos Ver 3 RPP	0.25	0.46	5.0	O.K
Fluoride	Mg/l	Spands method	0.125	0.19	1.5	O.K
Hardness	Mg/l	Calmagite	-	-	150	-
Aluminum	Mg/l	Ascorbic acid	0.02	0.02	0.2	O.K
Iron (Total)	Mg/l	Ferro Mo/DR890	0.01	0.82	0.3	O.K/NO T
Copper (Cu ²⁺)	Mg/l	-	-	-	1.0	-
Manganese(Mn ²⁺)	Mg/l	Oxidation	0.019	0.13	0.2	O.K
Arsenic	Mg/l	Comparison	-	-	0.01	-
Total Coli Form	Cfu/100 ml	Membrane filtration	0.0	0.0	0/100ml	O.K
E.Coli		Membrane filtration	0.0	0.0	0/100ml	O.K

Sample: Borehole water from Gombe (STD = Standard)

Table 2 Water Quality Analytical Results from Gombe Regional Laboratory

Parameter	Unit	Method Used	Result 06.08.08	Result 02.12.08	Nigerian STD.	Remarks
Appearance	-	Visual	brown	Clear	Un-Obj	Not O.K
Color	Pt-co	Color Filtration	10.0	90.0	15.0	Not O.K
Odor	NT	Sensory Organs	-	Un-Obj	Un-Obj	Not O.K
Taste	-	Sensory Organs	S.Salty	Slightly salty	Un-Obj	Not O.K

Temperature	O ^c	Thermometer	26.8	29.0	Ambient	O.K
PH-Value	pH	pH Meter	6.77	6.77	6.5 -8.5	O.K
Conductivity	μS/cm	Conductivity meter	7680	680	1000	(Not) O.K
Turbidity	NTU	Turbidity meter	412.85	57.3	5.0	Not O.K
TDS	Mg/l	Conductivity meter	3930	340	500	(Not) O.K
DO	Mg/l	DO Meter	0.12	3.40	7.0	O.K
Chlorine (Free)	Mg/l	DPD Method	-	-	0.25	-
Chloride	Mg/l	DPD Method	-	-	250	-
Nitrate (NO ₃)	Mg/l	Nitra Ver 5 RPP	24.3	7.40	50	O.K
Nitrite (NO ₂)	Mg/l	Nitri Ver 2 RPP	-	1.68	0.2	Not O.K
Sulfate (SO ₄)	Mg/l	Sulfa Ver 4 RPP	80	47.0	100	O.K
Phosphate (PO ₄)	Mg/l	Phos Ver 3 RPP	0.11	0.16	5.0	O.K
Fluoride	Mg/l	Spands method	1.26	0.25	1.5	O.K
Hardness (CaCO ₃)	Mg/l	Calmagite	-	2.40	150	O.K
Aluminum	Mg/l	Ascorbic acid		0.05	0.2	O.K
Iron (Total)	Mg/l	Ferro Mo/DR890		-	0.3	-
Copper (Cu ²⁺)	Mg/l	-	-	0.008	1.0	O.K
Manganese (Mn ²⁺)	Mg/l	Oxidation	0.004	-	0.2	O.K
Arsenic	Mg/l	Comparison	-	0.0	0.01	O.K
Total Coli Form	Cfu/10 0ml	Membrane filtration	0.0	0.0	0/100ml	O.K
E.Coli		Membrane filtration	0.0		0/100ml	O.K

Sample: Borehole water from Gombe

Gombe regional laboratory lack most of classical analytical instruments found in literature, talk less of some high technology ones described in literature (GodeJohan et al 1997, Speight 2005). With such serious lack of analytical instruments, the monitoring of pollutants by this laboratory can not be done efficiently. Contamination of water by toxic metals is one of the most visible water pollution, referred to as heavy metal pollution, as it occurred in Minamata Japan (Singh, 2004, Allchin, Kugler, 2004), but metals like lead, mercury are not monitored in this laboratory. In Figure 1 below comparison of the Gombe Regional Laboratory result is made with the Nigerian Standard for Drinking Water (Nigerian Industrial Standard NIS 554, 2007). The results showed good agreements with the standards because the results' values except for nitrite are much below the maximum allowed limits. In Table 2 where the result compared here is taken, one can see that the laboratory personnel made a comment that this value is not okay, this means the high value is actually from the sample and not a failure from the instruments. But good as this result may look like; there are many parameters that are not measured by this laboratory. In the Drinking Water Standard (Nigerian Industrial Standard NIS 554, 2007) many inorganic constituents are given and most of them have very low limits, parameters like Arsenic 0.01- mg/l, Barium 0.7mg/l, Chromium 0.05mg/l, Cyanide 0.01mg/l, Lead 0.0-1 mg/l, Hydrogen Sulfide 0.05mg/l, etc.

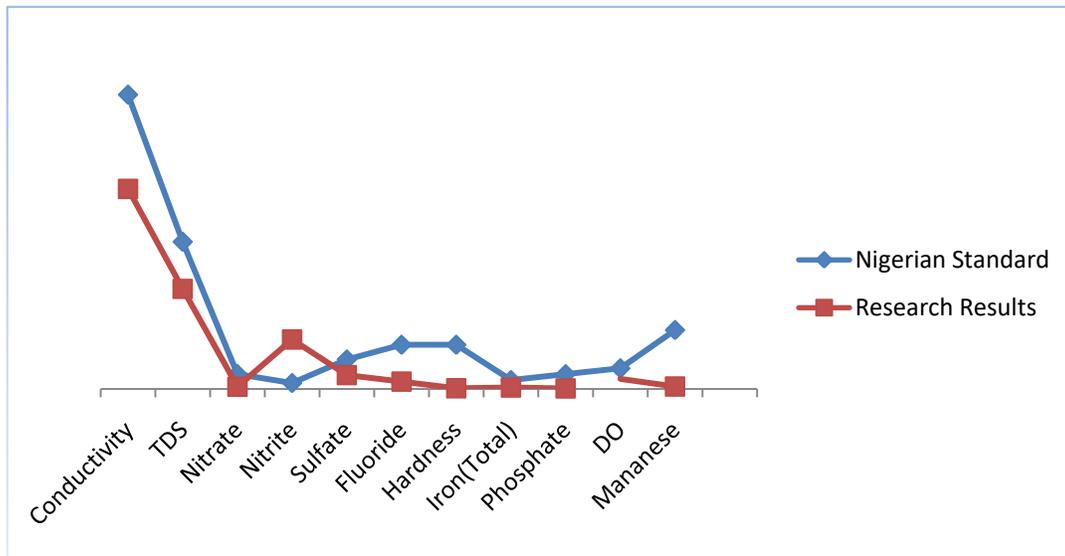


FIGURE 1 RESEARCH RESULTS COMPARED WITH NIGERIAN DRINKING WATER STANDARD (IN mg/L, EXCEPT CONDUCTIVITY $\mu\text{S}/\text{cm}$)

These low limits shows how important it is to make sure such pollutants are not found in drinking water, but they have not been measured by the Gombe Regional Laboratory. If they are available in such water it means they are being consumed by human beings and animals to the detriment of their health. The reason for not monitoring heavy metals and other pollutants in water is lack of instruments or where they are available they are non functional. There are many classical analytical instruments available for such analysis (Stanley, 2000) and many new ones have been described (Cai et al, 2009, Wen et al, 2009) which can be used for better and accurate determination of such metals and other pollutants in water. The measures for chemical laboratory to established quality management have been described in the literature (Funk.W. et al, 2005), these measures include the facilities and equipments of the laboratory, this is lacking in the research laboratory.

A result of Drinking water analysis done in a laboratory in Germany is described in the literature (http://www.stadtwerke-bad-reichenhall.de/wasser/Anal_2004.pdf). The analyses were made based on specific standards as seen in the table in this literature. These standards do not only give the limit but also the analytical methods to be used, methods of calculations where necessary even formulas to be used. If we compare this with the results obtained from the research laboratory, there was no one quotation of any standard used in the analysis. If results from the Nigerian laboratory will have to meet certain standards, not only the maximum allowed limits should be given but specific analytical methods for specific analysis have to be given in the Nigerian standard or international standard with these specifications will have to be adopted. In the result given in http://www.stadtwerke-bad-reichenhall.de/wasser/Anal_2004.pdf, there were 102 parameters tested, but in the research laboratory drinking water analytical results only 25 parameters were given. This makes only 24.5% of the parameters analyzed in the drinking water in the German example above. A class of pollutants seen in the German drinking water analysis, namely organic pollutants was completely absence in the drinking water research laboratory result. It can be seen that the detection limits of the analytical instruments used for this class of pollutants are very low. This class of pollutants needs advanced or accurate instruments to be able to achieve such low limit of detection e.g. Benzo fluoroethane was measured with an instrument with detection limit of $0.001\mu\text{g}/\text{l}$ (Hermann, 1992).

Some parameters like arsenic, cyanide, lead, mercury, nickel, etc. have very low values in the guidelines compared above which show that they are serious health related parameters which should be carefully controlled, but as already mentioned they were not measured in the regional laboratory results due to lack of analytical instruments. Recently the U.S Center for Diseases Cnontrol and Prevention (CDC) reported 169 deaths from lead poisoning in Nigeria (U.S.CDC, 2010), this case was not in drinking water, but we can not rule out some part of the lead ending up in underground water, this demonstrate how important it is to test for heavy metals like lead. In the Nigerian guidelines itself, (Nigerian Industrial Standard NIS 554, 2007) many parameters are missing such as organic pollutants like benzene, dichloroethene, tetrachloromethanes, and vinyl chloride, if these parameters are not even given in the guidelines, then monitors will not make effort to analyze them. Nigeria uses chlorine in water purification and a lot of pesticides are used in the country, but byproducts from such activities are not included in the guidelines. Nkono et al (1998) used the WHO guideline in their study of trace metals in drinking water in southern part of Nigeria; another study was carried out by Musa et al (2007) they also used the WHO guideline for their study; this confirms that the Nigerian guidelines don't have all the parameters needed for drinking water analysis. In the study carried out by Musa et al (2007) Cd was found in many drinking water samples they collected, but Cd was not amongst parameters measured by the research laboratory. If a regional laboratory does not check for the

presence of Cd in drinking water sample and an academic analysis detected this metal in many water samples, then there is a serious gap left between the quality of water people are drinking and the results the monitoring laboratories are providing.

CONCLUSION

The research laboratory has only few basic analytical instruments, which prevent them from carrying out comprehensive analysis of pollutants. There is a great need for the research laboratory to get more analytical instruments as described in the literatures so as to cover more vital pollutants in their drinking water quality control and monitoring of pollution. The Nigerian standard for drinking water does not cover some vital pollutants like the heavy metals, some organic byproducts, etc.

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Determination Of Heavy Metals In Soils At Gombe Town, Gombe, North Eastern Nigeria.

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DOI: 10.29322/IJSRP.10.09.2020.p10575

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10575>

Abstract

The heavy metals content of soils where determined in Gombe state, North-Eastern Nigeria, the heavy metals analyzed in this study are, Cd, Cr, Pb, and Zn using an Atomic Absorption Spectrophotometer (AAS), Perkin Elmer 400ASS (9). A general overview of the study shows that Pb had the highest concentration, and Cr had the least concentration. The trend of heavy metals in the study is as follows; Cr < Cd < Zn < Pb. the result of the heavy metal analysis shows that the concentrations of heavy metals in the soils at the study sites where below the permissible limits of the various metals for soil and thus are of no environmental or health consequences and the soil is relatively safe for cultivation of agricultural crops.

Key words: Heavy metals, Atomic Absorption Spectrophotometer, Soil, Concentration.

1.0 INTRODUCTION

Soils are made up of particles, gaseous and liquid constituents. They act as sink for pollutants through the adsorption process which bind inorganic and organic pollutant with varying strength to the surface of soil colloids, Soil may become contaminated due to the accumulation of metals via emissions from industrial sites, mining operations, and disposal of wastes containing metals, leaded gasoline, and paints, application of fertilizers and animal manures, other agrochemicals and spillage of petrochemicals (1). Heavy metals are natural components of the earth's crust that are not biodegradable. Heavy metals tend to be transferred into the human body through the ingestion of food materials, water and air. At low concentration levels, certain heavy metals such as copper, manganese, zinc and iron are essential in maintaining certain body functions. However above the recommended concentrations they pose health risk (2). Examples of heavy metals include, Ar, Cd, Co, Cu, Au, Ag, Fe, Mn, Hg, Ni, Pb, and Zn (1). Some heavy metals become toxic at levels slightly above the background concentrations normally present in nature. It is necessary to provide information about the health impact of metals and carry out proactive measures to prevent excessive exposure to heavy metals. Heavy metal toxicity is a critical medical condition when it occurs. If not detected or not properly treated, it leads to serious health issues and reduce the quality of human life (3). The presence of toxic heavy metals (at levels that contaminate) in soil pose risk and creates health issues in humans and also affects the ecosystem via the direct intake of food and drinking of contaminated ground water. It also affects the quality of food (affecting the safety and market value of such foods) via reduction in land usability for agricultural production, leading to food insecurity (4). Living organisms require trace amounts of some heavy metals e.g. cobalt, vanadium, strontium and zinc (5). The increase in the uptake of these heavy metals by plants and animals (most of which ends up as food for

man) pose as health risk to humans. Excessive levels of essential metals can have environmental effects on organisms. Non-essential metals of such as Cd, Cr, Hg, and Pb even at low concentrations pose threats to the health of humans. The main threats to human well-being however, are associated with lead, arsenic, cadmium, and mercury (5). Plants have the capacity to accumulate metals (from water, and soil) that are essential for growth and development; examples of these metals are Fe, Mn, Zn, Cu, and Ni (6). Heavy metals are toxic if they cannot be metabolized by the human body and thus accumulate in the soft tissues of the human body. Heavy metals tend to get into the human body via food, water, air, or absorption by skin due to contact with humans during agriculture and manufacturing processes, also in pharmaceuticals, industrial, and residential environments. Exposure from industries is a means of exposure in humans. Ingestion serves is the most common means of exposure in children. The no hand-to-mouth activity of small children often result to toxic levels of heavy metals concentrations when they come in contact with soil contaminated with the metals or by consuming substances which are not eatable foods such as dirt or paint chips, (7). Less common routes of exposure are from a suicide or homicide attempt involving the use of substances containing the toxic metals (8).

This study involves the determination of heavy metals (Cd, Cr, Zn and Pd) concentrations in soil at Gombe town, North-Eastern Nigeria. The significance of this study is to provide information on the heavy metal content of soil in certain parts of Gombe town and also enlighten the public on the ability of food crops to absorb and bio-accumulate heavy metals from soils and also the adverse effects of these metals on human health.

2.0 MATERIALS AND METHODS

2.1 Study Site

Gombe is the capital of Gombe state located in the North- Eastern part of Nigeria with an estimated population of 261,536, and a geographical location of Latitude; $10^{\circ} 16' N$, and Longitude $11^{\circ} 09' E$.

2.2 Sample collection, preservation and pretreatment

Soil samples were collected from five different sites at Gombe town (Pantami, Bolari, G. R. A., Herwagana, Tudun Wada). Samples were obtained from soil surface from a depth of 0 – 20cm, at ten different spots for each sample site with the help of stainless steel spoons and made into a composite sample. The soil samples were placed into a nitric acid treated polythene bags to prevent metals from adhering to the containers, transported to the laboratory, air dried for about 3days then oven-dried to constant weight at $105^{\circ}C$, ground to powder in a ceramic pestle and mortar, sieved, and stored for further treatment.

(5, 2).

2.3 Sample digestion

Soil samples were digested with 15mL of concentrated acid mixtures (5mL conc.HClO₄, 15mL conc.HNO₃, and 10mL conc. H₂SO₄) was poured into the 100mL beaker containing the soil sample (1g), covered with watch glasses, and heated over a water bath in a fume cupboard until the digestion was complete. The content of the beaker was then diluted to 100mL with de-ionized water and transferred to dispersing bottles for heavy metal analysis (2, 9).

2.4 Apparatus/ reagents

All apparatus used such as glass wares, sample bottles, burette, and pipettes were washed cleaned and rinsed with HNO₃, and rinsed further using distilled water to avoid errors arising from contamination. All reagents used were of analytical grade (10, 11).

2.5 Method of Analysis

The Atomic Absorption Spectrophotometric (AAS) method is employed in this study, because it is readily accessible, has a wide range of application, also for its specificity, and having a low detection limit (11). The heavy metals content of soil samples were determined using an Atomic Absorption Spectrophotometer (AAS), Perkin Elmer 400ASS (9).

2.5 Statistical Analysis

The minimum, maximum, average values, and standard deviations of the concentrations of heavy metals in soil samples were determined using Microsoft excel (windows 2007).

3.0 RESULTS /DISCUSSION

Cadmium

The average concentration of Cd in soils at Gombe 0.88 mg/Kg was greater than the values for irrigated soils in Gombe state, Nigeria reported by Babangida *et al.*, (2017) and by Ibrahim *et al.*, (2014) also greater than the maximum concentration in soils at Mwazan Region in Tanzania reported by Kisamo, (2003), but less than the recommended limit for soil set by USEPA. Pantami had the highest concentration of Cd this could be due to the use of agrochemicals, presence of waste dumps in the area (13). The lowest concentration was at Bolari, this could be as a result of low agricultural activities, absence of industries and dumpsite at Bolari. Cd nonessential to the health of humans and animal, at higher concentrations in organisms above the recommended limits it is toxic (14). Cadmium accumulates in human body creating adverse effects on the soft tissues and organs (kidney, lungs, placenta, liver, and brain) as well as the bones (1, 15). Cadmium accumulation in humans also leads to certain health issue affecting systems of the body such as reproduction, growth and development, renal functions, blood and immune systems (15).

Chromium

Cr concentration in the soil samples was an average value of, 0.54 mg/Kg was within the range of Cr concentration in irrigated soils at Gombe state, Nigeria reported by Babangida *et al.*, (2017), but less than the concentration of Cr in soils at Makurdi reported by Ogidi, (2015), the maximum value at Mwazan Region in Tanzania reported in Kisamo, (2003), the content of soils at Keritis, Chania, Greece reported in Papafilippaki1, *et al.* (2007) and also less than the recommended limit for soil (3000 mg/kg) set by USEPA. The highest concentration of Cr was observed from soils at Pantami, this could be due to the use of agrochemicals, and dumping of domestic and agricultural waste (13). The least concentration was at G.R.A and Herwagana both having the same concentration; this could be due to the absence of serious agricultural activities, absence of industries and dumpsites. The Cr content in the soils could have originated from domestic, industrial and agricultural waste disposal, application of organic manures, inorganic fertilizers with the use of pesticides, insecticides and herbicides on the soil. Excessive concentration in soils has adverse implication on the health of humans and animals due to it bioaccumulation in plants (1, 15).

Lead

The concentration of Pb in soils has a mean value of 6.54 mg/Kg this is greater than the concentration in irrigated soils at Gombe state, Nigeria reported by Babangida *et al.*, (2017), the value for soils reported in Papafilippaki1, *et al.* (2007), but less than the mean

concentration of Pb in soil at Makurdi, North Central Nigeria reported by Ogidi, (2015), and the recommended limit for soils set by USEPA. The highest concentration of Pb was observed in Tundun Wada; this could be due to vehicle emission, use of leaded gasoline and disposal of waste paint cans e.t.c. (9). The lowest concentration was observed at Herwagana. Excess Pb content of soils above regulatory limits create serious health hazards to humans and animals as a result of its ability to bio-accumulate in soft tissues (brain, liver, lungs, kidneys) and other tissue like bones, hair and teeth, creating organ and tissue failures (17).

Zinc

The Zn concentration of soils in this study has an average value of 2.74 mg/Kg which is less than the value range in irrigated soils at Gombe state, Nigeria reported by Babangida *et al.*, (2017), less than the mean concentration of Zn in soil at Makurdi, North Central Nigeria reported by Ogidi, (2015), and the mean value for soils at Mwazan Region in Tanzania reported by Kisamo, 2003 also below the regulatory limit of Zn in soils (50mg/Kg) set by WHO (2007). The highest concentration was observed at Herwagana this could be due to the presence of Zn smelting, and fabrication industries around the area. The lowest concentration of zn was observed at Pantami. The Zn content of the soil has no serious toxicity hazard to humans, animals or plants, but often zinc contaminated soils are also contaminated with non essential elements such as Cd and Pb (20).

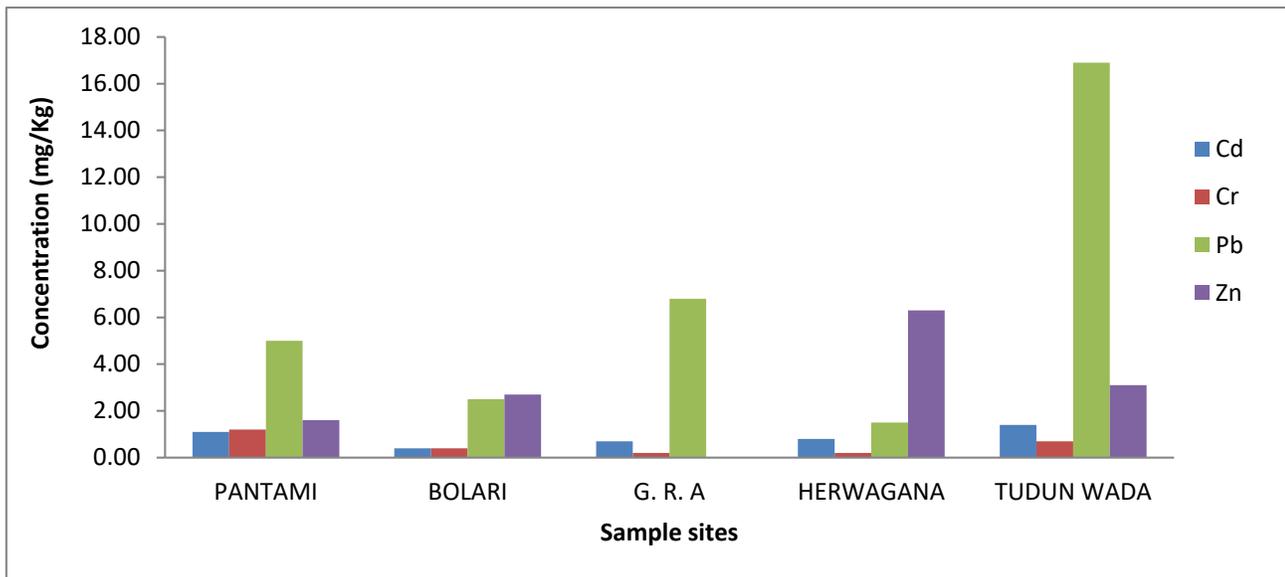


Figure 1: Heavy Metals Content of Soils at Gombe.

Table 1: Statistics of heavy metal content of soils at Gombe.

Parameter	Cd	Cr	Pb	Zn
Max	1.10	1.20	16.90	6.30

Min	0.40	0.20	1.50	1.60
Average	0.88	0.54	6.54	2.74
Std Dev	0.38	0.42	6.15	2.32

(a) Max = maximum, (b) Min = minimum, (c) Std Dev = standard deviation

4.0 Conclusion

Heavy metals were found to be present in all soil samples at the various sites sampled, Pb was present in all sample and had the highest concentration at Pantami, G.R. A and Tundu Wada this could be as a result of vehicular emission, use of gasoline containing lead and lead paints, e.t.c., Cr had the least concentrations in soil at study sites except at Patami where Cd had the least concentration in soil samples. At G.R.A. Zn was not detected in the soil. A general over view of the study shows that Pb had the highest concentration, and Cr had the least concentration. The trend of heavy metals in the study is as follows; Cr < Cd < Zn < Pb. The heavy metals were all below the recommended limits required for soils.

4.1 Recommendation.

Heavy metals contents of soils need to be monitored at all times to ensure safety of agricultural products for consumption, and also prevent heavy metals poisoning due to soil ingestion. Soil serves as a sink for many pollutants and some are transferred into ground waters. Plants have ability of absorbing and adsorbing heavy metals from the soil, thus if crops are planted on heavy metals contaminated soils the plants absorb the metals, and when eating by humans and animals this heavy metals bio accumulates in tissues and organs in the body. There is a need to determine and analysis the heavy metal content of soils before cultivation of crops. The government needs to enforce regulations on indiscriminate dumping of industrial, domestic and agricultural waste.

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The Role of the Value of the Sensitivity and Specificity of Leukocytes, Neutrophils in the Diagnosis of Acute Appendicitis of Children in Haji Adam Malik General Hospital Medan

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DOI: 10.29322/IJSRP.10.09.2020.p10576

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10576>

ABSTRACT

Acute appendicitis in children is one of the causes of the emergency abdomen that requires immediate surgery. (Victor, et al., 2012; Ballester et al., 2009; Huckins et al., 2013). The incidence of acute appendicitis in children in the world ranges from 1-8% of all pediatric patients who come to the Emergency Department (IGD) with complaints of acute abdominal pain (Jangra et al., 2013). In 2006 acute appendicitis was ranked 4th in Indonesia, after dyspepsia, duodenitis, and other gastrointestinal diseases with the number of hospitalized patients reaching 28,949 (Eylin, 2009).

During this acute inflammation of the appendix is established based on history taking, physical examination, laboratory examination, or complete blood. There are two markers of the results of complete blood laboratories which are often used for cases of appendicitis in the first 24 hours after the onset of pain, namely leukocytes and neutrophils. On a complete blood count found leukocytes between 10,000-15,000 / mm³ (leukocytosis), although leukocytes count is commonly used in children with suspected acute appendicitis, this is not specific and not sensitive to this disease. Although several studies show an association between increased levels of leukocytes with a diagnosis of appendicitis, the results vary greatly (Al-gaithy, 2002).

The study will be carried out in the Division of Pediatric Surgery in RSUP H. Adam Malik Medan to determine the role of the sensitivity and specificity of leukocytes and neutrophils in the diagnosis of acute appendicitis in children. This research is an observational analytic study with a cross-sectional design. Sampling was done by consecutive sampling. There were 54 research samples whose mean age was 10.02 ± 3.17 years. The data collected is presented descriptively in the frequency distribution table.

Keywords: acute appendicitis, leukocytes, children

INTRODUCTION

In Physiology Appendix is a lymphoid organ such as tonsils, Peyer patches (analogous to the Fabricus Exchange) to form immunoglobulin products. The appendix is a small structure, shaped like a tube that connects attached to the initial part of the cecum. The appendix produces 1-2 ml of mucus per day. The mucus is normally poured into the lumen and then flows to the cecum.

Histologically, the appendix has the same structural basis as the large intestine. The mucosal gland is separated

from vascular submucosa by the mucosa masculine. The outside of the submucosa is the main muscle wall. The appendix is covered by serous tunica which consists of vascularization of large blood vessels and joined together in the mesoappendix. If the appendix is located retroperitoneal, the appendix is not covered by serous tunica.

Anatomically the vermiform appendix is an intestinal diverticulum that is approximately 6-10 cm in size and is located in the caecum. This organ is tubular with a narrow lumen in the proximal part and widening in the distal part, the capacity of the appendix itself is approximately 0.1 ml. This

organ is composed of lymphoid tissue and is an integral part of GALT (Gut Associated Lymphoid Tissue). The most appendix locations are from the posteromedial caecum, below the ileocaecal junction. The appendix itself has a mesentery that surrounds it, called the mesoappendix which originates from the posterior part of the mesentery which surrounds the terminal ileum. The most position of the appendix is retrocaecal, however, there are variations from the location of this appendix. 65% of the appendix position is intraperitoneal while the rest is retroperitoneal. Here the variation in the position of the appendix determines the symptoms that will appear when inflammation occurs (Aschraff, 2000). The most position is retrocaecal, however, the position of the appendix can be found by tracing the three taeniae found in the caecum, namely taenia colica, taenia libra, and taenia omentalis.

Appendicitis is inflammation that occurs in the appendix vermiformis and is the most common cause of acute abdomen. Until now it has not been known exactly what the function of the appendix is actually. Appendicitis can be caused due to infection or obstruction in the appendix. The obstruction causes the appendix to swell, changes in normal flora and is easily infected by bacteria. If the diagnosis is made slowly, perforation can occur in the appendix. So that the result is Peritonitis or abscess formation around the appendix (Schwartz, 2009).

Acute appendicitis can be caused by an inflammatory bacterial process that is triggered by several precipitating factors including lymphatic tissue hyperplasia, fecaliths, appendix tumors, and clogged ascetic worms. Mucosal ulceration is the initial stage of most of these diseases (Sabiston, 2008)

The appendix produces 1-2 ml of mucus per day. The mucus is normally poured into the lumen and then flows into saikum. Barriers to mucus flow in the appendix estuary appear to play a role in the pathogenesis of appendicitis. Appendicitis is usually caused by obstruction of the appendix lumen by lymphoid hyperplasia of the lymphoid, fecalith, foreign body, stricture due to fibrosis due to previous inflammation, or neoplasm. At the beginning of appendicitis, the patient may not have fever or subgenres. Higher temperature increases are associated with perforated appendicitis (Lee, 2013). Classic symptoms are only found in 55% of cases if the appendix is anterior. (Lee, 2013) Symptoms begin with abdominal pain in the periumbilicus that weighs in 24 hours.

Atypical symptoms are associated with variations in the location of the anatomy of the appendix (Lee, 2013). Blunt pain often appears when the tip of the appendix is located retrosecally. Findings of physical examination in children can vary depending on the age of the child. Irritability can be the only sign of appendicitis in neonates. Older children often appear uncomfortable or alone, preferring to lie still due to irritation of the peritoneum. Teenagers often have a classic

sign of appendicitis (Minkes, 2013). Most children with appendicitis are not feverish or subfebrile (Minkes, 2013). On general physical examination usually found a temperature of 38 oC or lower, fluctuating temperatures may indicate an appendix abscess (DynaMed, 2013).

Leukocyte counts increase in 70-90% of cases of acute appendicitis. However, the increase is usually mild and only clearly visible after more than 24 hours of the disease course or after the disease process continues. An increase in neutrophils was also found to be more than 75% in 78% of patients with acute appendicitis (Craig, 2013).

Histopathology examination is the gold standard of diagnosis of appendicitis. In the early stages of appendicitis, the appendix appears macroscopically with dilated serous blood vessels. At an advanced stage of appendicitis, macroscopically there are signs of mucosal necrosis to the outer layer of the appendix wall and gangrene can be found. Normal appendix findings at the time of surgery require careful histopathological examination. Occasionally, grade 1 (early appendicitis) appendicitis is only identified on histology and is clinically correlated with resolution of symptoms before surgery.

Appendices that have been inflamed will not heal completely but will form scar tissue that causes adhesions to the surrounding tissue. This adhesiveness can cause repeated complaints in the lower right abdomen. At one time this organ can become inflamed more acute and declared to have an acute exacerbation (Santacrose, 2006).

In the study of Hani Noh (2012) all patients were classified in the simple appendicitis group and the complicated appendicitis group based on postoperative histopathology. Complicated appendicitis is defined as gangrenous appendicitis and / or perforation. This difference is not clear and only clinically relevant differences from simple appendicitis and complicated appendicitis will be used.

METHOD

The study was conducted from April to November 2018. The research will be conducted at the Children's Surgery Division of H. Adam Malik General Hospital Medan to determine the role of the sensitivity and specificity of leukocytes and neutrophils in the diagnosis of acute appendicitis in children. This research is an observational analytic study with a cross-sectional design. Sampling was done by consecutive sampling. There were 54 research samples whose mean age was 10.02 ± 3.17 years. The data collected is presented descriptively in the frequency distribution table. Data between the laboratory components of neutrophils and leukocytes is numerical data, so the hypothesis test is analyzed with an unpaired t-test. Followed by the Receiver Operating Characteristic (ROC) analysis of each

predictor to determine the sensitivity and specificity of the appendicitis outcome variable.

RESULTS AND DISCUSSION

In this study, 54 research samples were analyzed by data. Of the 54 patients, the mean age was 10.02 ± 3.17 years, consisting of 31 (57.4%) males and 23 (42.6%) female patients. From the data, it was also obtained that from 54 study samples, there were 27 patients (50.0%) patients included in acute appendicitis and 27 (50.0%) patients included in complicated appendicitis. The ratio between the sexes of men versus women was also obtained from other studies, which stated that the ratio of men is higher than women with a ratio of 3: 2 (Schwartz, 2009). Demographic data of patient characteristics sampled are listed in Table 4.1.

In this study, the comparison between acute appendicitis and complicated groups of leukocyte and neutrophil values. From table 4.2, it was found that the values of leukocytes in acute appendicitis and complicated appendicitis sequences were 14,377.41 ($\pm 7,014.99$) and 18,130.37 ($\pm 5,648.33$) with p values of 0.035. While the neutrophil value in the acute and complicated appendicitis group was 74.80 (± 14.77) and 82.38 (± 7.03) with a p-value of 0.021.

Based on the analysis using the Receiver Operating Characteristic (ROC) curve, the leukocyte variable has an area under the curve (AUC) of 66.7% compared to neutrophils which have an AUC of 63.6%. With a cut-off value of 77.90%, neutrophils have a sensitivity of 81.50% and a specificity of 48.15%. Whereas the leukocyte value, with a limit value of $> 12,000 / \text{mm}^3$ will give a sensitivity value of 92.60% with a specificity value of 44.44%.

Our results are quite by the results stated by Xharra in 2012 from his research stating that neutrophil sensitivity and specificity are 79.1% and 68%, whereas leukocyte sensitivity and specificity are 85.1% and 68%, thus concluded by Xharra that leukocytes are slightly better predictors of appendicitis than neutrophils (Xharra, 2012).

CONCLUSION

From the research we have done, it can be concluded that there is no difference in the role of sensitivity and specificity values of leukocytes and neutrophils in the diagnosis of acute appendicitis in children.

SUGGESTION FOR FUTURE RESEARCH

Further research should be developed to assess the role of other predictors in diagnosing appendicitis, especially

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10576>

in children. So that later in making a diagnosis of appendicitis, especially in children will be easier.

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Effect of Grouper Collagen and Cork Fish Albumin for Making Wound Ointment

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DOI: 10.29322/IJSRP.10.09.2020.p10577
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10577>

Abstract- The wound healing component consists of albumin, collagen, omega 3 and omega 6. These components become active substances in ointments used for wound healing. Ointment is a semisolid preparation that is soft, easy to apply, and is used as an external medicine on the skin. The source of albumin is snakehead fish, a source of collagen is grouper skin, omega 3 from flaxseed oil, and omega 6 from black cumin oil. The aim of this study was to obtain the optimal collagen concentration in making the best ointment. This study used different collagen concentrations, namely 0.4%, 0.6%, and 0.8%. then analyzed physics (pH and viscosity), chemistry (protein, fat and water), organoleptic odan. The test results were then analyzed using the de garmo method to determine the best quality ointment. The best results then tested the amino acid profile and zinc levels. The results of this study were the tiger grouper skin collagen concentration of 0.8% was the optimal concentration to produce the best collagen ointment. including a pH value of 6.8, a viscosity value of 27909 cP, a protein content of 11.61, a fat content of 79.01, and a water content of 2.55.

Index Terms- ointments, collagen, proximate, amino acids

I. INTRODUCTION

Grouper is a seawater fish that has high economic value and is one of the export commodities, especially to Singapore, Japan, Hong Kong, Taiwan, Malaysia and the United States. In Indonesia there are seven genera of grouper fish, namely *Aethaloperca*, *Anyperodon*, *Cephalopholis*, *Chromileptes*, *Epinephelus*, *Plectropomus*, and *Variola*. Of the seven genera, generally only the genus *Chromileptes*, *Plectropomus*, and *Epinephelus* are commercial, especially for the international market, such as humpback grouper, sunuk grouper (including genus *Plectropomus*), mud grouper and tiger grouper (including genus *Epinephelus*) (Affan, 2012). Nearly about ¾ of the total fish weight is waste. Fish waste consists of bones, skin, fins, heads, scales and offal. Thus, fish waste is one of the biggest problems in the fish processing industry. Fish waste can pollute the environment both on land and in waters. In fact, fish waste still contains quite high protein. Therefore, the use of fish waste into a product will reduce environmental pollution (Atma, 2016). One of the products that can be made from fish waste is collagen.

Ointment is a semisolid preparation that is soft, easy to apply, and is used as an external medicine on the skin and mucous membranes. The release of medicinal substances from the ointment base is strongly influenced by physico-chemical factors both from the base and from the medicinal substance, solubility, viscosity, particle size, homogeneity and formulation (Hernani, *et al.*, 2012).

The composition of the ointment consists of a medicinal or active substance and an ointment base or commonly known as the active ingredient carrier. Ointment has a function as a carrier for active substances to treat diseases of the skin, as a lubricant and skin protector (Parwanto, *et al.*, 2013). The aim of this study was to obtain the optimal collagen concentration in making the best ointment. The research results are expected to provide information, especially for the health sector and fishery product processors, that fish skin waste can be used as collagen for addition in making ointments..

II. MATERIALS AND METHODS

2.1 Material

The research materials used consisted of raw materials and materials for the collagen-making process in the form of grouper skin and snakehead fish meat for making albumin. Other materials used are distilled water, dialysis membrane, acetic acid (CH₃COOH), NaOH, label paper, tissue and blacu cloth. Meanwhile, the ingredients used to make the ointment are adeps lanae, vaseline flavum.

This research method is an experimental method. In this study, the objective of this research was to obtain the optimal concentration of collagen in tiger grouper to add to the collagen ointment in order to obtain the best ointment quality.

2.1.1 Preparation of Albumin Extract

The production of albumin extract begins with the preparation of raw materials, namely the snakehead fish is turned off, then weeded, filled, diced and washed. Next, the snakehead fish is weighed 250 grams, then put into a steamer with a temperature of 70oC. The snakehead fish meat is steamed for 30 minutes. After that it is filtered and the filtrate is taken. Snakehead fish extract is ready to use.

2.1.2 Making Collagen

The first time to make collagen is to prepare the skin of the grouper which has been removed from the scales. Then the skin of the grouper is cut 1 x 1 cm. Then the grouper skin was immersed in 0.1 M NaOH for 24 hours with a ratio of skin and solution of 1:10. After that the grouper skin is neutralized with distilled water. Then soaked in acetic acid with a ratio of 1:10 for 24 hours. Then filtered and taken the filtrate. After that, the precipitation was carried out with 0.9 M NaCl for 24 hours. Then centrifuged at 3500 rpm for 20 minutes. Then dialysis with 0.5 M acetic acid with a ratio of 1:10. After that it is inserted into the cellophane membrane. Then soaked in 0.1 M acetic acid solution for 6 hours. Then soaked in distilled water to neutral pH. After that the collagen is ready for use.

2.1.3 Making Collagen Ointment

Preparation of the ointment begins by adding BHT to the first mortar, then adding the oil phase of the snakehead fish extract and grinding it until the BHT dissolves. Add a little adeps lanae and mix until homogeneous. Then dissolve the methyl paraben and propyl paraben on propylenglycol in a beaker glass, then add the water phase of the snakehead fish extract, stirring until it is homogeneous. In the second mortar, the remaining adeps lanae is added, gradually adding the mixture of methyl paraben, propyl paraben, and the water phase of snakehead fish extract while stirring until homogeneous. Then mix the first and second mortar ingredients, added with vaseline flavum, crushed until homogeneous. The preparation is put into an ointment pot (Andrie and Sihombing, 2017). The addition of grouper skin collagen, flaxseed oil and black cumin oil was done when mixing the first and second mortars.

III. RESULT AND DISCUSSION

3.1 pH

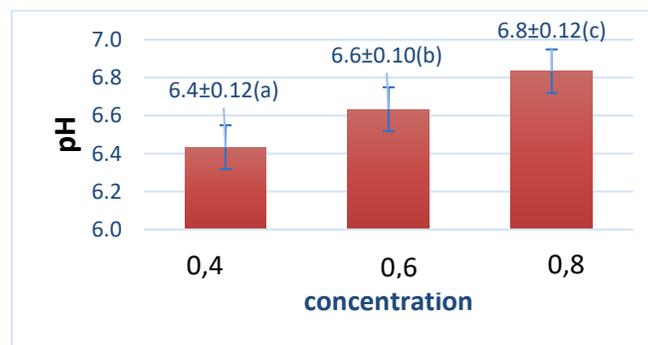


Figure 1. The Result of pH

The pH of collagen ointment with different collagen concentrations results in different pH values. At a collagen concentration of 0.4%, a pH of 6.4, a concentration of 0.6% was 6.6 and a concentration of 0.8% was 6.8. The pH of the collagen ointment showed

an increase with the difference in collagen concentration. The pH of the collagen ointment is as expected, that is, the pH is within the normal pH range of the skin, which is between 4.5 - 7, so it doesn't cause irritation or scaly skin. (Patimasari *et al.*, 2015).

3.2 Viscosity

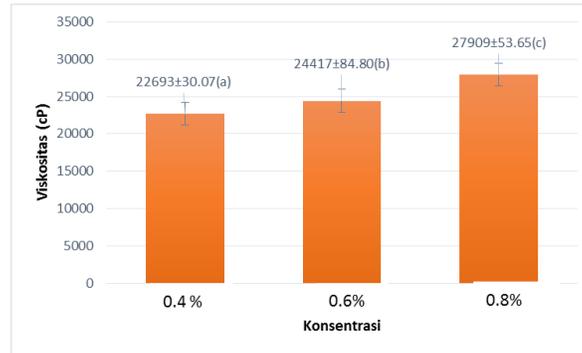


Figure 2. The Result of Viscosity

The viscosity value at the collagen concentration of 0.4% was 22693 cP, a concentration of 0.6% obtained a viscosity value of 24417 cP, and at a concentration of 0.8% was 27909 cP. The result of the viscosity of the ointment which has the highest value is the collagen concentration of 0.8% of 27909 cP, and the lowest yield is at a concentration of 0.4% of 22693 cP. The viscosity range for a good ointment is 2000-4000 cP. (Husnani and Muazham, 2017).

3.3 Organoleptic

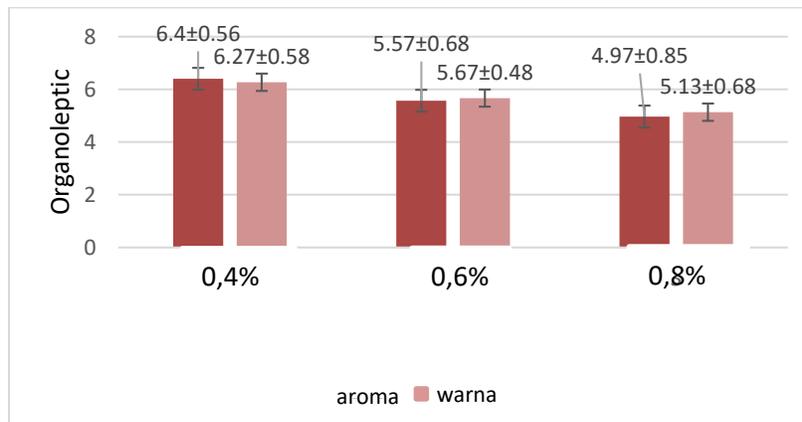


Figure 3. The Result of Organoleptic

There are differences in the results of the organoleptic test along with differences in collagen concentrations. The organoleptic value of color in the treatment with a concentration of 0.4% was 6.27, a concentration of 0.6% was 5.67 and a concentration of 0.8% was 5.13. While the treatment of different collagen concentration concentrations in the aroma parameter, the concentration of 0.4% is 6.4, the concentration of 0.6% is 5.57 and at a concentration of 0.8% shows a value of 4.97.

3.4 Protein Content

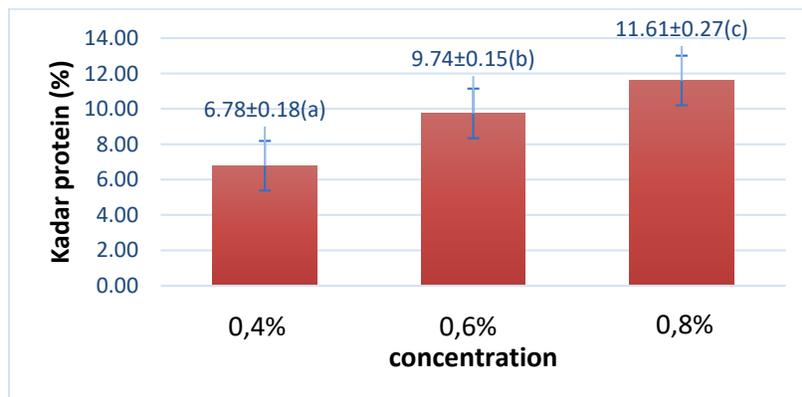


Figure 3. The Result of Protein Content

There are differences in protein levels in collagen ointment from differences in collagen concentrations. At a collagen concentration of 0.4%, a protein content of 6.78% was obtained, a concentration of 0.6% was 9.74% and a concentration of 0.8% was 11.61%. The value of protein content in collagen ointment shows an increase with differences in collagen concentration. The highest protein content in collagen ointment was with a collagen concentration of 0.8% at 11.61% and the lowest with a collagen concentration of 0.4% at 6.78%. It can be concluded that the higher the collagen concentration, the higher the protein content.

3.5 Fat Content

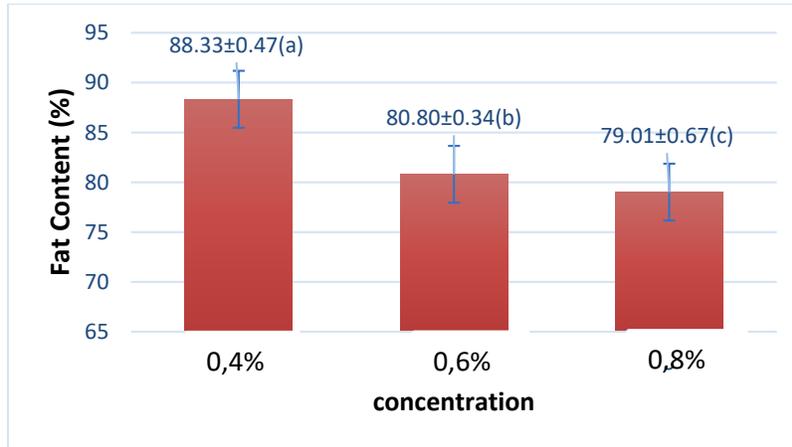


Figure 4. The Result of Fat Content

Based on Figure 5, there are differences in the fat content of collagen ointment from differences in collagen concentrations. At a collagen concentration of 0.4%, a fat content of 88.33% was obtained, a concentration of 0.6% was 80.80%, and a concentration of 0.8% was 79.01%. The value of fat content in albumin ointment shows a decrease with increasing collagen concentration, this is because the amount of ointment base added along with the increase in collagen decreases.

3.6 Water Content

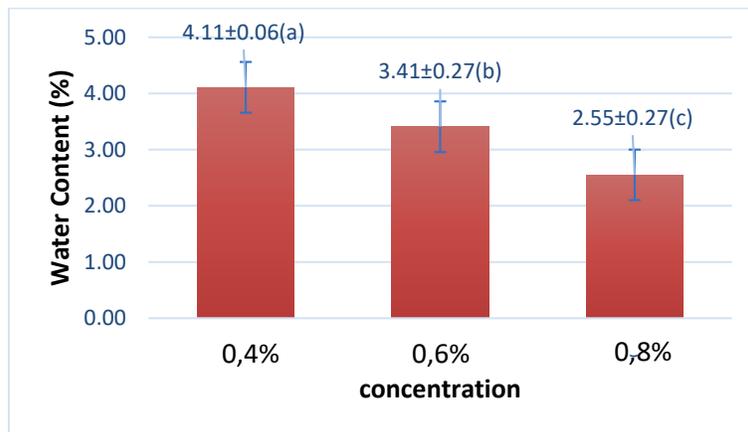


Figure 5. The Result of Water Content

At a collagen concentration of 0.4%, a water content of 4.11% was obtained, a concentration of 0.6% was 3.41%, and a concentration of 0.8% was 2.55%. The water content of the collagen ointment showed a decrease in line with the difference in collagen concentration. According to research by Chakim *et al.*, (2014) that the final water content of a processed product depends on the type and amount of liquid added. Low water content can extend shelf life, because low water content can limit microbial growth and chemical reactions (Amanto *et al.*, 2015).

3.7 Amino Acid Profile

No.	Parameter	Unit	Result
1.	L-Histidine	mg / kg	7953,99
2.	L-Threonin	mg / kg	32009,99
3.	L-Prolin	mg / kg	121672,79
4.	L-Tyrosin	mg / kg	4430,99
5.	L-Leucin	mg / kg	27642,52
6.	L-Aspartic Acid	mg / kg	41081,04
7.	L-Lysin	mg / kg	29005,85
8.	Glysin	mg / kg	254443,74
9.	L-Arginine	mg / kg	93756,70
10.	L-Alanin	mg / kg	80027,37
11.	L-Valin	mg / kg	23543,34
12.	L-Isoleucin	mg / kg	14185,78
13.	L-Phenylalaninw	mg / kg	23778,19
14.	L-Glutamic Acid	mg / kg	81131,23
15.	L-serin	mg / kg	39223,25

The highest amino acid content in tiger grouper skin collagen was glycine at 254443.74 mg / kg and the lowest was L-Tyrosine at 4430.99 mg / kg. The collagen of tiger grouper skin is then used as an active ingredient in collagen ointment. The results of the amino acid content of collagen ointment are as follows.

No.	Parameter	Unit	Result
1.	L-Histidine	mg / kg	217,02
2.	L-Threonine	mg / kg	694,98
3.	L-Prolin	mg / kg	2836,07
4.	L-Tyrosine	mg / kg	<66,93
5.	L-Leucin	mg / kg	641,09
6.	L-Aspartic Acid	mg / kg	1153,22
7.	L-Lysin	mg / kg	798,64
8.	Glycine	mg / kg	5597,56
9.	L-Arginine	mg / kg	2021,47
10.	L-Alanin	mg / kg	1961,40
11.	L-Valin	mg / kg	532,20
12.	L-Isoleucine	mg / kg	319,94
13.	L-Phenylalanin	mg / kg	450,18
14.	L-Glutamic Acid	mg / kg	2058,01
15.	L-serin	mg / kg	981,10

The highest amino acid content in collagen ointment was Glycine at 5597.56 mg / kg and the lowest was L-Tyrosine at <66.93 mg / kg. The high level of the amino acid glycine indicates the presence of collagen. In general, protein does not contain much glycine. The exception is collagen, where two-thirds of all amino acids are glycine. Glycine is a non-essential amino acid for humans (Sobri, *et. al.*, 2017).

IV CONCLUSION

The conclusion obtained from this study is that 0.8% tiger grouper skin collagen is the optimal concentration to produce the best collagen ointment. including a pH value of 6.8, a viscosity value of 27909 cP, a protein content of 11.61, a fat content of 79.01, and a water content of 2.55.

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Use of Metagenomics as an Approach to Relations between Algae and Bacteria: A Review

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DOI: 10.29322/IJSRP.10.09.2020.p10578

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10578>

Abstract In this review, we present many different classes of ecological relationships in which are registered interactions among algal and bacterial organisms. The uses of molecular techniques as metagenomics to test hypothesis, evaluate subjacent processes and searching for patterns in microbial communities are included and discussed. Our documental research suggests that great advances have been accomplished in this discipline until now, and many of these advances were through metagenomics application. Nevertheless, some questions and aspects of relations algae-bacteria remain not answered yet and metagenomics could be a power and useful working tool.

Index terms: alga, bacteria, relationships, interactions, metagenomics.

I. INTRODUCTION

Bacteria are a huge group of ubiquitous organisms with a variety of metabolic pathways and diverse behavioral and reproductive adaptations for surviving in different environments¹. On the other hand, unicellular or pluricellular algae are a complex group of photosynthetic organisms that have exhibited several applications on diverse fields for their efficiency as bioindicators, remediation of natural resources and producers of substances for energetic purposes^{2,3}. These organisms can establish many kinds of interactions that have been proved to be useful and beneficial for many aspects of human life.

Nowadays, the understanding of different ecological relationships between algal and bacterial organisms are included in a wide study field, because of the benefits that can be applied from the deep knowledge that can be reached. While algae there are well known, bacteria are so far from this reality because of their high genetic diversity and mutation rates, that determines their speciation rates and quick adaptation to adverse environments and conditions⁴. In this sense, we are far from have good estimations of the number of species of bacterial organisms. Nevertheless, several molecular techniques have been developed to accomplish this matter.

Metagenomics has been proved to be a powerful and useful technique for identifying groups of bacterial taxa and their abundance as necessary tools for richness and diversity estimations of these organisms in experimental or natural communities. This method could be used as a tool; not only for biodiversity estimations purposes or community ecology studies, as well for detecting interactions between species of bacteria helping to identify what taxa of bacterial could enhance and bring more efficiency to optimize processes as wastewater management⁵.

To conduct this review, we started from basic concepts of ecological relationships between organisms to aboard the aspects of the algal-bacterial interactions. Then, we define metagenomics and mentioned examples of the use of the technique in problems of algae-bacteria relations reported on specialized literature in order to compile and analyze the trends in the use of this technique for resolution on several problems in diverse environments and organisms as models of study and different scales.

II. ECOLOGICAL RELATIONS

Species are not living in isolation. The different ecological relations between them are the base of ecosystems. Ecological relationships describe the interactions between and among organisms within their environment. These interactions may have positive, negative, or neutral effects on species and their fitnesses⁶ Different types of interspecific interactions have different effects on the

organism involved, which may be neutral, positive, or negative. Sorting this, derived six major types of ecological interactions: mutualism, competition, parasitism, commensalism, amensalism and neutralism. All these relations are present in bacteria species ⁷.

One of the remarkable examples of symbiosis in which bacteria are involved are legumes, who perform symbiosis that most other plants do not, including *Arabidopsis* ⁸. Legumes are considered as important source of protein for animals and for human populations. Nitrogen-fixing soil bacteria from genus *Rhizobium* colonized their roots and with mycorrhizal fungi that contribute to the acquisition of phosphorus. The development of the root nodule meristem is unique, as it is possible to define your site, the time of initiation, the type of target cell and ontogeny ⁸.

a. Ecological relations between algae and bacteria

Bacteria are crucial to ecosystem functioning, and play vital roles in carbon, nitrogen, and sulfur cycles. The interaction between two microbes is the fundamental unit of microbial interactions, in combination with ecological interactions previously mentioned, traditionally considered by the investigation efforts on microbial interactions understanding ⁷., and this interactions networks between species are the result influence of abiotic and biotic factors ⁸.

In different ecosystems, microorganisms form heterogeneous communities, different proportions and various entities of microorganisms (Archaea, Eukarya domains and kingdom Protista), collectively known as “microbiome” ⁹. Microorganisms in a microbiome do not live in isolation, but actively interact with other members within their community. Taken together, these interactions are a description of how microbial community works generally, and what role each individual play within the community. As such, the characterization of microbial interactions is a key step towards understanding community organization, which may be using metagenomic and the engineering of microbial communities for biomedical and industrial applications⁷.

III. USE OF METAGENOMICS IN EXPLORATION OF ALGAE-BACTERIA INTERACTIONS

a. Metagenomics

The objective of metagenomic studies consist doing an evaluation of the coding potential of environmental organisms, quantifying the relative abundances of (known) species, and estimating the amount of unknown sequence information (environmental sequences) for which no species, or only distant relatives, have yet been described ⁶. . Metagenomics can be defined as the genomic analysis of microbial DNA from environment communities. This hypothesis is proposed by many authors as: “*Genomic DNA sequence, and even complete genomes in some cases, has been generated from organisms that exist only in tight association with other organisms, including various obligate symbionts and pathogens, members of natural microbial consortia and an extinct cave bear.*” ⁷.

This has been considered a specific, sensitive, quantitative, and high-throughput tool for microbial detection, identification, and characterization in natural environments. Metagenomics is an emerging technology to study microbial communities, as well is a powerful tool for determinate thousands of genes simultaneously in a single experiment. Sequencing of the entire genome (metagenomic) using the “*shotgun*” technique, approach that employs cloning and paired-end sequencing of plasmid libraries. Until now many projects based on these methodologies include data sets from an acid mine biofilm, seawater samples, deep-sea sediment, or soil and whale falls ⁶.

Microbial communities have been characterized in natural and engineered ecosystems using a variety of molecular methods, the results obtained with these methods can be incomplete as they do not capture the whole complexity of microbial communities ⁸. This methods were the following, ribosomal spacer analysis (RISA), terminal restriction fragment length polymorphism (t-RFLP), denaturing gradient gel electrophoresis (DGGE), 16S rRNA clone libraries, and fluorescence in situ hybridization (FISH) were applied to evaluate bacterial community structure not only in biological reactors from wastewater treatment plants but also in other ecosystems such as edaphic, marine and atmospheric microbial systems. ⁸.

Gophna *et al.* (2016) worked with *Oscilospira* an under-studied anaerobic bacterial genus of Clostridial, that cannot isolate in cultures, they signalized that in recent years used of study with 16S rRNA gene was used for interesting traits about these bacteria. For understand the metabolism and physiology, they used nearly complete genomes derived from shot-gun metagenomic data from their natural environment, the human gut, to analyze *Oscilospira* and related bacteria ⁹

Recent metagenomic studies exposed that Antibiotic Resistance Genes (ARGs) predominantly cluster by ecology. Implying that the resistome in soils, and wastewater treatment plant differ significantly from that of human pathogens ^{10,11} that is one of the important points of metagenomics studies. ARGs are in many causes associated with conjugative elements such as plasmids or transposons. While the transfers of these elements may also occur through transformation or transduction, conjugation is often considerate as the

most likely responsible mechanism¹². With all the increase in environmental levels of antibiotics, driven by medical and agricultural demand, is unprecedented and has disrupted the natural balance between microbes and antimicrobials¹². That can include bacterial community in reactors.

Xia *et al.* (2010) explored the microbial community composition of five biological wastewater treatment reactors in China and the United States applying high-density microarrays targeting universal 16S rRNA genes. This study got as a result a consistent composition of microbial community structure among all five reactors. They took in account interactions between the organisms in the microbiome as a description of the overall function of the microbial community. As such, the characterization of microbial interactions is a key step towards the understanding of the community organization and the engineering of microbial communities for biomedical and industrial applications¹³.

Exists alternative approach for doing a taxonomic profiling of complex communities of bacterial using a set of protein-coding marker genes, extracted from large-scale environmental shotgun sequencing data, to provide a more direct, quantitative, and accurate picture of community composition than that provided by traditional ribosomal RNA-based approaches depending on the polymerase chain reaction¹⁴. This is an alternative for the commonly microarrays targeting universal 16S rRNA genes.

Lima-Mendez *et al.* (2015), presented part of the “Tara Oceans” project. In this work, they used environmental factors and organism abundancy profiles for study the photic zone interactome. They found that environmental factors could predict the community structure but, in an incomplete way. Also, they found that local and global patterns had an influence on the non-randomly distribution of the functional types and phylogenetical groups present at as compounds of plankton. Finally, they identified interactions among grazers, primary producers, viruses, and (mainly parasitic) symbionts and validated network generated hypotheses using microscopy to confirm symbiotic relationships, providing a resource to support further research on ocean food webs and integrating biological components into ocean models³.

For the evaluation of predicted interactions, they realized a co-occurrence technique have heretofore mainly been applied to bacteria (Figure 1). They detected eukaryotic interactions based on analysis of sequences at the V9 hypervariable region of the 18S ribosomal RNA (rRNA) gene. They built a literature curated collection of 574 known symbiotic interactions (including both parasitism and mutualism) in marine eukaryotic plankton. Prokaryotic 16S rDNA metagenomic reads were identified, annotated, and quantified (Figure 2)³. With Spearman and Kullback-Leibler dissimilarity measures, they constructed co-occurrence networks, from inferred networks trough taxon-taxon.

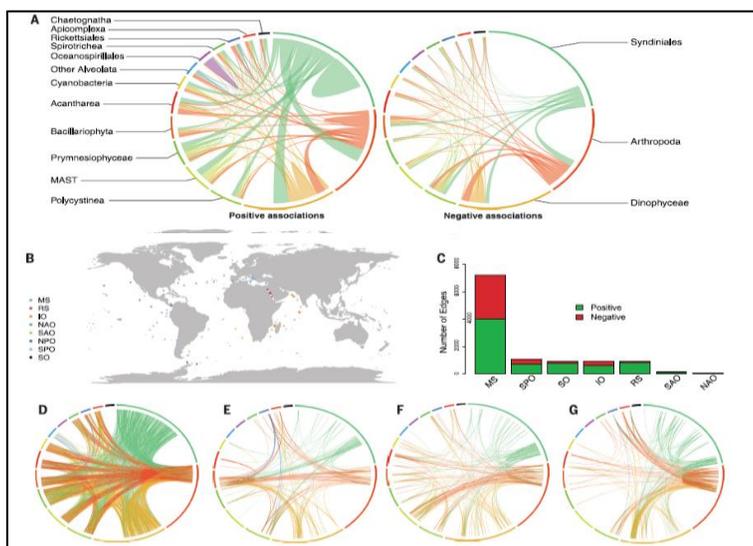


Figure 1: Taxonomic and geographic patterns within the co-occurrence network presented by:³. (A) Top 15 interacting taxon groups depicted as colored segments in a CIRCOS plot (B) Tara Oceans sampling stations grouped by oceanic provinces. (C) Frequency of local co-occurrence patterns across the oceanic provinces, showing that most local patterns are located in MS. (D to G) Taxonomic patterns of cooccurrences across MS (D), SPO (E), IO (F), and RS (G). Deeper descriptions of these figures are contained in³.

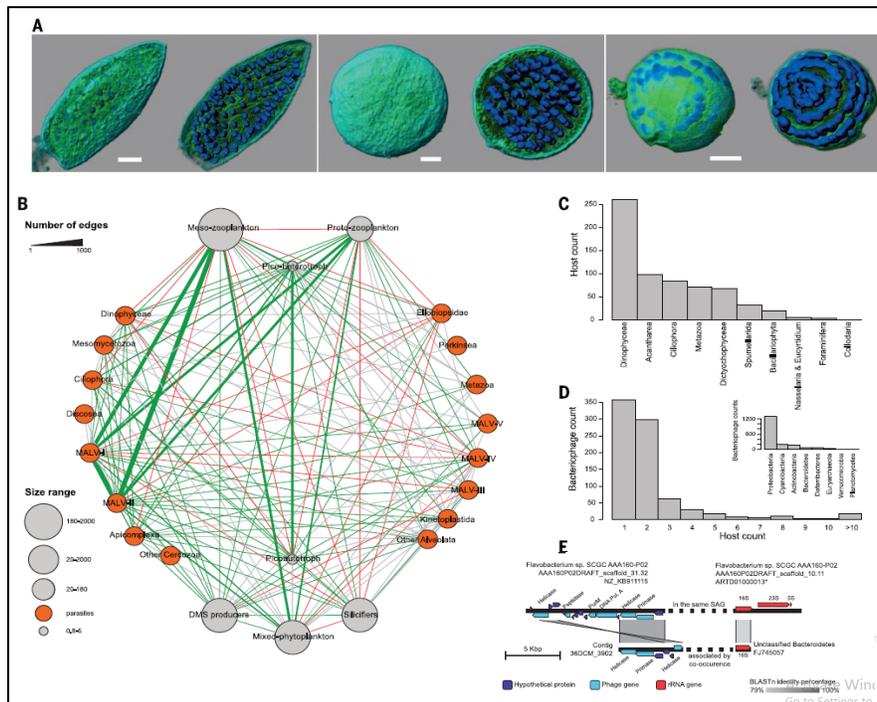


Figure 2: Top-down interactions in plankton obtained and described by ³. (A) Three different dinoflagellate specimens from Tara samples display an advanced infectious stage by syndiniales parasites. (B) Subnetwork of metanodes that encapsulate barcodes affiliated to parasites or PFTs. (C) Parasite connections within micro- and zooplankton groups. (D) Number of hosts per phage. (Inset) Phage associations to bacterial (target) phyla. (E) Putative Bacteroidetes viruses detected with co-occurrence and detection in a single-cell genome (SAG). More detailed explanations of the charts are included in ³

Dagan *et al.* (2013) reported the genome sequences for the morphologically most complex true-branching Cyanobacteria, and for *Scytonema hofmanni* PCC 7110, which with 12,356 proteins is the most gene-rich prokaryote currently known. They investigated components of cyanobacterial evolution that have been vertically inherited, horizontally transferred, and donated to eukaryotes at plastid origin. The vertical component showed a freshwater origin for water-splitting photosynthesis. Networks of the horizontal component reveal that 60% of cyanobacterial gene families have been affected by lateral gene transfer. Plant nuclear genes acquired from cyanobacteria define a lower bound frequency of 611 multigene families that, in turn, specify diazotrophic cyanobacterial lineages as having a gene collection most like that possessed by the plastid ancestor. To identify plant nuclear genes of cyanobacterial origin, they reconstructed 35,862 phylogenetic trees containing both eukaryotic and prokaryotic homologs and looked for trees in which plants and cyanobacteria branch together. Also, they focus their attention to the larger set of nuclear genes of cyanobacterial origin whose homologs are not universally distributed among cyanobacteria. For 611 plant nuclear gene families identified as plastid acquisitions, scored gene presence and absence, and protein sequence identity among cyanobacterial genomes (Figure 3).

Today plastids supply fixed carbon to plant cells, but they also have a myriad of other functions in amino acid, lipid, and cofactor biosynthesis as well as nitrogen metabolism. They think that the crucial reasoning on the selective advantage, was to the establishment of the plastid has it that the production of carbohydrates by the cyanobacterial endosymbiont was the key. An alternative suggestion is that the initial advantage of plastids may have simply been their uniquely useful metabolic product, O₂, as a boost to respiration in early mitochondria ¹⁵.

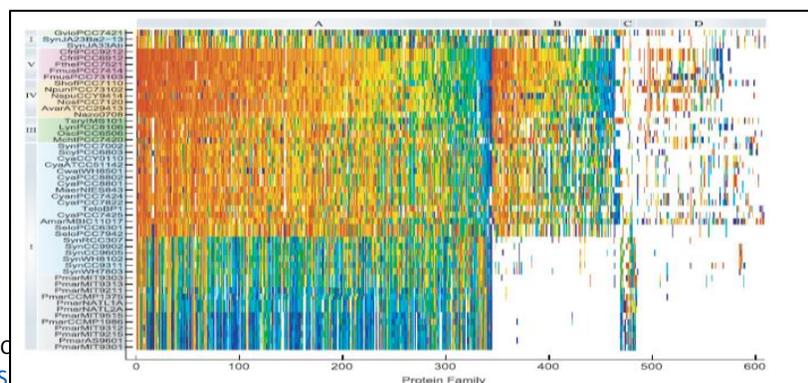


Figure 3: Presence/absence and sequence similarity patterns of cyanobacterial protein families by comparison with their homologs of endosymbiotic origin in six photosynthetic eukaryotes by ¹⁵ “Amino acid sequence similarity between the cyanobacterial proteins (x axis) and their counterparts in the eukaryotic plastid-derived set of protein families (y axis), as deduced for the genomes in the data set. Cell shades in the matrix correspond to the similarity ranking for each protein family (i.e., line) according to a color gradient from red (high similarity) to blue (low similarity). White cells correspond to genes lacking in the respective genomes. Protein families are ordered according to their distribution pattern into (A) nearly universal, (B) sparse representation or (C) highly frequent in the oceanic species, and (D) generally sparse representation.

IV. CONCLUSION

The microbial world is a fascinating world, so far, we need to go deeper and get to know the microbiomes in depth. Considerable progress has been made in recent years, the studies of the different ecological relationships, those relationships that are the basis of ecosystems. Great advances have been made, one of the great key points for the study of communities of microorganism and their relationships has been the metagenomic, this technological advance has allowed to deepen the knowledge about the ecological relationship between species of the microbial world. Much work remains to be realized, there is still a long way to go until the moment to know what the role of each species is and how these are related to each other, in addition to their role within the community and the niche to which they belong to in addition to their ecological role in nature.

Also, the metagenomic studies can be the basis for other studies such as proteomics, based on the genetic sequences, we can continue to advance to depth and discover the behavior and the different interactions between different organisms.

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Influence Of Resources On Implementation Of Strategic Plans In Public Secondary Schools In Kakamega County, Kenya

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DOI: 10.29322/IJSRP.10.09.2020.p10579

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10579>

Abstract- Implementation of strategic plans would enable institutions realize their objectives and enhance good performance. From studies carried out, a number of institutions that have formulated strategic plans, implementation aspect has been a challenge. The purpose of this study was to analyse the influence of resources on implementation of strategic plans in public secondary schools in Kakamega County. Objective of the study was to determine influence of resources – human, finance, infrastructure and time on implementation of strategic plans in public secondary schools from Kakamega County. The study used a combination of descriptive survey design and correlation design targeting a total population of 645 respondents with a sample population of 173. Multiple stage sampling techniques were applied. The study used questionnaires and interview schedules as instruments for data collection alongside document guide list. Questionnaires were validated through application of content validity analysis determined by expert judgement. Piloting of the questionnaires was carried out in eight selected public secondary schools and split half technique applied to ascertain the reliability of the instruments. Correlation co-efficient for Board of Management (BoM) chairpersons, Parents Association (PA) chairpersons, Principals and senior teacher's instruments were 0.85, 0.81, 0.87 and 0.84 respectively. This indicated high reliability of instruments. Both descriptive statistics and regression analysis were adopted. In addition, the researcher carried out document analysis of strategic plans for individual schools sampled out. The study established that resources had significant influence on implementation of school strategic plans at $p < 0.05$ level of significance with a p value of 0.043. Regression analysis revealed that implementation of strategic plans was predicted to increase by 0.395 when resources go up by one. From the results, resources explained 10.4% of the variation in the implementation of strategic plans. The study established that resources for implementation of strategic plans in public secondary schools from Kakamega County were inadequate. The study recommends that more resources be allocated in public secondary schools to ensure effective implementation of strategic plans in order to enhance performance in these institutions.

Index Terms- Resources (human, infrastructure, finance and time), Strategy, strategic plan and strategic implementation.

I. INTRODUCTION

Strategy implementation has been premised to be an aid in enhancing institutional performance. Oslen (2017) avers that a strategic plan is important to an organization because it provides a sense of direction and outlines measurable goals. It is a tool that is useful in guiding day-to-day decisions and evaluating progress. As a management tool, Oslen (2017) opines that a strategic plan helps an organization do a better job, because it focuses the energy, resources and time of everyone in the organization in the same direction. A number of institutions world-wide have gradually embraced strategic planning process in order to enhance their performance. In cognisance of this, Lawler (2006) posits that organizations that do not plan have exponentially higher rates of failure than those that plan and implement their plans. Successful implementation of strategic plan therefore is key to any organizations success and survival since it will enable the organization to realize her objective and vision.

Globally, some countries have made it mandatory for schools to formulate strategic plans in line with national strategic plans. Bell (2002), notes that in 1989, the United Kingdom (UK) government put emphasis on the staff to develop their own priorities in line with national goals and objectives and come up with strategies to achieve them. In Australia, the government has gone a step ahead and made a guideline of what schools should include in their strategic plan (State of Victoria, 2010). The United Kingdom government passed the 1988 Education Reform Act which gave the responsibility of planning to schools (Giles, 1995) both cited in Njeru et al (2013).

Ezugwu (2013) observes that whereas some countries initiate and implement their development plans, others initiate but do not implement them. He goes on to state that 90% of the plans made by developed world like Japan are fully implemented while in contrast 90% of plans made in developing world like Nigeria are not fully implemented. As a result, even though sound plans are made in most of the developing countries they are hardly implemented and therefore no meaningful development is achieved as the objectives of the plans are not realized.

In 1998 Uganda introduced the first five years Education Sector Investment Plan (ESIP), the first genuine educational sector programme (Government of Uganda, 2012). It focused principally on primary education. It was followed by Education Sector

Strategic Plan (ESSP) 2004 – 2015. The first ESSP revision 2007 – 2015 reflected towards free secondary and revision of the curriculum, while the second revision 2010 -2015 prioritised access, equity, relevance and efficiency of education (Government of Uganda, 2012). Currently, Education and Sports Sector Strategic Plan 2017 – 2020 under implementation aims at providing the policy framework that will guide the education sector through its ambitious goal of providing quality education with an insufficient resource envelope (Government of Uganda, 2017)

In Kenya, with the introduction of Results Based Management and Performance Contracting in early 2000, various ministries including the Ministry of Education were to come up with Ministerial Strategic plans. It was a statutory requirement that public organizations, including government ministries develop strategic plans as a means of enhancing result-based management and efficiency in their operations. Strategic planning process was to set the foundation of effective performance measurement systems as individuals and departments would be measured against the set targets. Performance management in public service was therefore to be operationalized by strategic plans. Consequently, in 2006, Ministry of Education came up with her five-year strategic plan 2006-2011 (Ngware, Odebero and Wamukuru 2006).

Literature on discourse regarding strategic planning process aver that implementation part of the process is the most difficult one Alexander (1985), Hrebiniak; (2006), Allio (2000), (Hussey 2000 and Thomson & Strick, 2003) all cited in Yang Li et al (2008), Pearce & Robinson (2009), Abok (2013) and Kirui (2013). Reasons advanced by these studies for the poor implementation of strategic plans among others point out such determinants as human and financial resources, strategic leadership, and management capacity. Pearce & Robinson (2009) have asserted that for a strategy to be implemented there should be sufficient resources.

A baseline survey carried out by the researcher found out that only 158 (39%) public secondary schools in Kakamega County out of 401 were undertaking strategic planning process. During the same period, a standard assessment carried out in Mumias Sub-County of Kakamega County in five secondary schools in February 2014 reported that only one secondary school had reviewed her strategic plan and was on course in implementing the plan. Two other institutions had strategic plans that were still in draft form yet the implementation period had expired and nothing as per the strategic plans had been done. The remaining two other institutions, their strategic plans which were “professionally developed” (by a consultant) had not been adhered to and therefore not implemented.

A survey by Ngware, Odebero and Wamukuru (2006) showed that over 60% of schools in the Country did not have strategic plans. Similarly, a baseline study conducted by Njeru, Stephen and Wamboi (2013) in Embu District showed that only two (2) out of twenty-four (24) public secondary schools 8.3% had formulated and were trying to implement strategic plans. From this baseline survey therefore, strategy implementation was still a challenge to a number of public secondary schools in Kenya hence an area of great interest for research.

Literature on strategic planning process aver that human, material, time and financial resources are vital when it comes to

implementation of strategic plans. Pearce & Robinson (2009) assert that the strategy to be implemented should be realistic in relation to available resources for its implementation. Kirui (2013) in his study found out that financial resources affected implementation of strategic plans in Local authorities in Migori County. This was through budgetary allocations, financial controls and external donors. In their study, factors affecting the implementation of strategic plans in Government Tertiary Institutions, Omboi and Mucai (2013) found out that resource allocation strongly influenced implementation of strategic management plans. This, they noted was through institutional leadership and the Board of Governors. They then concluded that sufficient resource allocation policies for equitable distribution of opportunities for staff development enhanced students’ performance. This study set out to establish if the same was applicable to public secondary schools in Kakamega County.

Buluma and Maende (2013) sought to determine effects of human resource factors that were affecting implementation of strategic plans in local authorities in Kenya. They found out that human related factors such as inadequate personnel (staffing) were a hindrance to implementation of council’s strategic plans. On the other hand, Pfeffer and Salancik (1978) Resource Dependency theory argue that an organization is dependent on the environment for its resources and that these resources literally control the organizations planning. They go on to aver that such resources may include skilled and dedicated staff, equipment, time and raising and utilization of funds. Resources, they aver that, are basis of power for organization.

Mwajuma (2013) observed that it was not practical for an organization to solely rely on external source hence NGOs had to develop contingency plan so as to have uninterrupted schedule of activities. The study emphasized the importance of resources in implementation of plans whether from internal or external sources. Scholars like Scott (2003), Osoro (2009), Kandie (2004) and Boyd (1990) all cited in Mwajuma (2013), have clearly cited unique resources as being key to effective strategy implementation. Pearce and Robinson (2009) concur with them when they aver that organizations with adequate resources will most likely achieve their objectives as opposed to those without or with very limited resources. They further assert that when a set of strategic programs has been decided upon it is implied that resource allocation has been made for these programs. Pearce & Robinsons position is echoed by Kibachia, Iravo and Luvanda (2014) who posit that without providing for the necessary assets and strategic expenditures a strategic program cannot be implemented successfully.

Olsen (2017) observes that to successfully implement strategic plan, one needs to have sufficient funds and enough time to support implementation. He argues that, often true costs are underestimated or not identified. True costs include a realistic time, commitment from staff to achieve a goal, a clear identification of expenses associated with a tactic or unexpected cost overruns by a vendor. Besides sufficient funds and time, he recommends that one must have the right people on board. By the right people, he refers to staffing and those with the requisite competencies and skills that are needed to support the plan. Thus during the planning process period, organizations should expand employee skills through training, recruitment or new hires to include new competencies required by the strategic plan.

Abok's, Waititu's, Ogotu's and Ragui's (2013) study indicated a positive relationship between implementation of strategic plans and resources. Their study was in conformity with Pearce and Robinson (2009) assertion that effective resources strengthen their strategic orientation by anticipating the challenges and problems of an organization through creating a reserve of resources that are very unique and strategic in the environment for their survival. Abok et al (2013) study concluded that organization resources played a big role in effective implementation of strategic plans in Non- Governmental Organizations in Kenya. This study therefore set out to analyse the influence of resources on implementation of strategic plans in public secondary schools in Kakamega County. Such resources as noted from the literature reviewed include, financial related resource, physical related resources, human related resource and time.

II. STATEMENT OF THE PROBLEM

As a statutory requirement, all public institutions in Kenya were to develop strategic plans as a means of enhancing results based management. In public secondary schools therefore strategic planning was to set the foundation for effective performance measurement and subsequently enhance school performance. Studies indicate that about 30% of public secondary schools are slowly embracing strategic planning process but implementation part of it still remains a challenge, resulting in well formulated strategies in a number of institutions that are hardly implementation.

It is from this premise that all public secondary schools in Kakamega County ought to aggressively undertake strategic planning process. Their strategic plans should be formulated with intentionality and practicality. Unfortunately, this seems not to be the case. For the few public Secondary schools in Kakamega County that had formulated strategic plans, some of them, their strategic plans documents could be found on book shelves gathering dust, rather than on desk top being implemented. This study therefore sought to address the question, what is the influence of resources on implementation of strategic plans in public secondary schools in Kakamega County, Kenya?

The Purpose and Objectives of the Study

The study set out to analyse the influence of resources on implementation of strategic plans in public secondary schools in Kakamega County. Specific objective of the study was to determine the influence of resources – human, financial, infrastructure and time on implementation of strategic plans

III. METHODOLOGY

The study adopted both descriptive survey design and correlation method and was conducted in Kakamega County in Kenya. The study targeted 632 managers from the 158 public secondary schools from Kakamega County that were embracing strategic planning process alongside 13 Sub County Quality Assurance and Standards officers (SCQASO). The total target population therefore was 645.

Multi Stage sampling technique was applied (Kothari and Gaurav, 2014). Stratified random sampling was used to select subjects for the sample to represent existing sub-groups in the population. These sub groups were National Schools, Extra County Schools, County Schools and Sub County Schools. In addition, the researcher also used purposive sampling specifically targeting only schools that were undertaking strategic planning process.

In an effort to get a representative sample of the population across the board, the researcher sampled out a total of 40 public secondary schools from the 158 public secondary schools in the County that were undertaking strategic planning process. This was a representative percentage of 25%. The sample selected therefore was slightly above a minimum acceptable sample for a descriptive research of 10% for a larger population and 20% for a small population (Gay, 1981). From this sample, it therefore implied that the number of respondents, namely, Board of Management (BoM) Chairpersons, Parents Association (PA) Chairpersons, principals and senior teachers or Heads of Departments (HoD) corresponded with the number of sampled schools as shown in table 1 below.

Table 1: Sample size and sampling techniques

Respondent	Target population (N)	Sample population (n)	%	Sampling techniques
BOM Chairperson	158	40	25	Multi-stage and stratified
P.A Chairperson	158	40	25	Multi-stage and stratified
Principals	158	40	25	Multi-stage and stratified
Senior Teachers	158	40	25	Multi-stage and stratified
Sub-County Quality Assurance and Standards Officers	13	13	100	Purposive
Total	645	173	26.8	

Questionnaires were developed and administered to each of the following respondents; BoM Chairpersons, PA Chairpersons, Principals and Heads of department respondents. Separately,

SCQASOs were interviewed using a tailor made interview schedule. The study also consulted documentary evidence, specifically individual school's strategic plans. The instruments

for this study were validated through application of content validity determined by experts' judgement. On the other hand, reliability of the questionnaires was determined by split half method of testing internal consistency using spearman Browns formulae after pre-testing in eight purposively selected pilot schools. Results for the reliability co-efficient of the instruments were; 0.85 for BoM questionnaire, 0.81 for PA questionnaire, 0.87 for principals and 0.84 for senior teachers.

Qualitative data from interview schedule was analysed qualitatively. This entailed thematic analysis, content analysis and then triangulation. Thematic analysis (categorization of related themes) involved analysing the main themes as found in the study. Whereas quantitative data analysis was subjected to descriptive statistics and regression analysis. When using descriptive statistics to analyse data, frequencies, percentages and measures of central tendency were calculated and subjected to analysis and interpretation. Regression analysis on the other hand was applied in particular when looking at the influence of resources on implementation of strategic plans. Regression analysis examines the influence of one or more independent variables on dependent variable (Kothari et al, 2014). Regression analysis produces a regression equation where the coefficients represent the relationship between independent variable and the dependent variable. The researcher used the regression equation to make a

prediction of the influence of resources on implementation of strategic plans.

IV. RESULTS AND DISCUSSION

The researcher first sought to establish the status of strategic plans in public secondary schools from Kakamega County with regard to the extent of their implementation. The study respondents were presented with 10 items on a 5-point likert scale. This instrument was prepared based on McNamara's (2005) Goal-Based strategic planning model that came up with ten steps in planning. An implementation matrix with a 5 point likert scale was used. The scale ranged from 0 to 1 with, 0 representing no action, 0.25 denoting a slight implementation, 0.50 average, 0.75 slightly above average and 1 full implementation. The midpoint of the scale was a score of 0.5. Therefore, mean rating below 0.5 denoted that strategic plans were not implemented or were slightly implemented – below average, while scores above 0.5 – midpoint denoted that implementation of strategic plans was above average, whereas an overall score of 1 would have denoted full implementation of strategic plans. Table 2 indicates analysis of the responses.

Table 2: Schools' strategic plans as per the implementation matrix

Implementation Status		No action (0)		Slight (0.25)		Average (0.5)		Slightly Above Average (0.75)		Fully (1)		Mean	Std Dev.
		F	%	F	%	F	%	F	%	F	%		
Operating within time Frame		4	10.0	10	25.0	4	10.0	6	15.0	16	40.0	.625	.3712
Progress in addressing strategic issues		6	15.0	8	20.0	14	35.0	8	20.0	4	10.0	.475	.2985
Workshops on implementation of the Strategic plan		12	30.0	21	52.5	7	17.5	0	0.0	0	0.0	.425	.2133
The School is realizing her targets as per the objectives		1	2.5	19	47.5	11	27.5	9	22.5	0	0.0	.406	.2381
Within Budget Provision as per implementation log frame		6	15.0	10	25.0	17	42.5	7	17.5	0	0.0	.400	.1772
Availability of resources for implementation		1	2.5	18	45.0	17	42.5	4	10.0	0	0.0	.369	.2467
Frequency of meetings and minutes on strategic plan		10	25.0	19	47.5	9	22.5	2	5.0	0	0.0	.269	.2071
Tasks accomplished as per plan		6	15.0	17	42.5	9	22.5	8	20.0	0	0.0	.256	.2228

Extent of monitoring and Evaluation exercise	14	35.0	12	30.0	13	32.5	1	2.5	0	0.0	.219	.1716
Progress reports and review on implementation status	17	42.5	12	30.0	10	25.0	1	2.5	0	0.0	.219	.2206
Overall mean											0.37	0.24

Results presented in Table 2 depicts that the mean scores obtained by the 40 sampled schools on the implementation of strategic plans ranged from 0.219 to 0.625 with a standard deviation of 0.2206 and 0.3712 respectively. The highest scored items were “operating within time frame (M=0.625)” and “progress in addressing strategic issues (M=0.475)”. On the other hand, the lowest scored items were “progress reports on implementation status (M=0.219)” and “extent of monitoring and evaluation exercise (M=0.219)”. From the study findings, it emerged that all the items except one (operating within time

frame) in the implementation matrix obtained a mean scores of below 0.5, meaning in most schools, implementation of strategic plans was below average (0.5). The overall implementation mean was 0.37 out of maximum average mean of 1. This score was below 0.5 – midway/ half, an indication that implementation of strategic plans was dismal and not as per implementation matrix. Only 1 school had fully implemented her strategic plan. Figure 1 illustrates an overall implementation status of the school strategic plans.

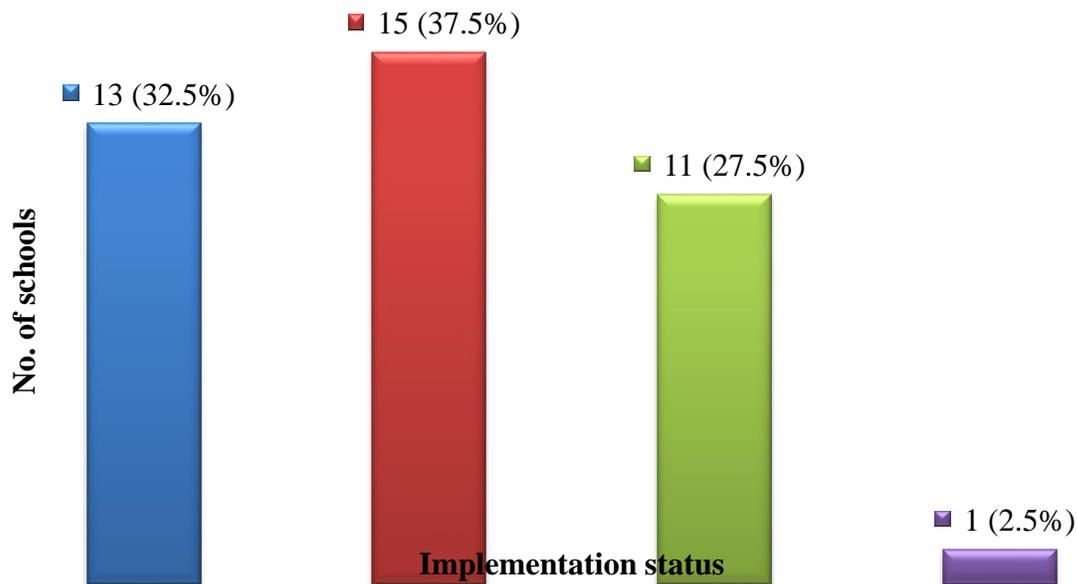


Figure 2: Overall implementation status of the school strategic plan

As shown in Figure 4.2, out of the 40 sampled schools, 13 (32.5%) had slightly implemented school strategic plans, 15 (37.5%) were average, 11 (27.5%) were slightly above average while the remaining 1 (2.5%) had fully implemented her strategic plan. This implies that majority of the schools a whopping 97.5% had not fully implemented their strategic plans. In concurrence with these results, Kefa (2014) established that most public secondary schools in Kiambu County had low implementation of the school strategic plans whereas, Njeru, Stephen and Wamboi (2013) found out that only 2 (8.3%) schools out of 24 were implementing their strategic plans.

Provision of resources

This study set out to determine the influence of resources on implementation of strategic plans in public secondary schools in Kakamega County. To address this objective, the researcher first sought to find out from the school principals and BOM whether they received finances to develop strategic plan. Table 3 shows findings obtained.

Table 3: Funded to develop school strategic plan

Response	Principals	BoM
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	Frequency	Percent	Frequency	Percent
Yes	8	20.0	6	15.0
No	32	80.0	34	85.0
Total	40	100.0	40	100.0

Data presented in Table 3 shows that majority of the principals (80.0%) and BoM chairpersons (85.0%) reported that their schools were not funded to develop strategic plans. Interview schedule corroborated these responses of Principals and BoM chairpersons. All the interviewed respondents were emphatic that resources were not provided for strategic planning process. They reported that schools were trying to source and save funds from other vote heads for strategic planning process. On source of funding for schools that were undertaking strategic planning process, respondents mentioned savings from free day secondary education funds, contributions from parents, savings from boarding vote head, seeking for sponsors and donors, appealing for assistance from the National Government Constituency Development Fund (NG-CDF) and the County government. All respondents in unison concurred that there was no specific vote head for strategic planning process where schools could get funds to undertake the process.

Financial constraint was therefore cited as a major challenge. Schools did not have adequate funds to implement activities hence hampering implementation of strategic plans. Interview schedule for Quality Assurance and standards officers revealed that over 75% of principals were competent enough and effectively managing their institutions. Asked why principals were not able to successfully implement strategic plans yet they were very competent in management, they responded that ‘No matter how competent a leader is, dynamics of resources in public institutions seem to greatly hamper their effectiveness and implementation of strategic plans’. This implied that with inadequate resources they could not do much despite being competent.

The researcher further sought to examine whether schools were able to implement strategic plans as intended despite having insufficient resources. The findings of this analysis are presented in Table 4.

Table 4: Fully implementation of strategic plan in school

Response	Principals		BOM	
	Frequency	Percent	Frequency	Percent
Yes	4	10.0	2	5.0
No	36	90.0	38	95.0
Total	40	100.0	40	100.0

As reflected in Table 4, 90.0% of the principals and 95.0% of the BOM cited that they were not able to implement their respective school’s strategic plans as intended.

Principals were asked to rate the adequacy of resources for strategic planning process in their respective schools. Table 5 demonstrates their responses.

Table 5: Adequacy of resources in school strategic planning process

Resources	Very adequate		Considerable adequate		Somehow considerable adequate		Inadequate		Very inadequate	
	F	%	f	%	F	%	f	%	F	%
Financial	0	0.0	9	22.5	10	25.0	17	42.5	4	10.0
Human	0	0.0	17	42.5	15	37.5	7	17.5	1	2.5
Infrastructure	1	2.5	9	22.5	12	30.0	13	32.5	5	12.5

Time	4	10.0	18	45.0	8	20.0	10	25.0	0	0.0
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Table 5 indicates that in terms of finances and infrastructure, over 42.5% of the principals rated the resources as inadequate while 10% rated the resources very inadequate for the implementation of strategic planning process. Rated slightly below 50% in terms of availability among the four resources was human resources at 42.5% and time at 45% as considerable adequate for implementation of strategic plans.

In order to determine the influence of resources on implementation of strategic plans, the study respondents were presented with 10 items on a 5-point likert scale. Table 6 presents results of the analysis on the influence of resources on implementation of strategic plans.

Table 6: Influence of Resources on Implementation of Strategic Plan

Statement	Principals		BOM	
	M	Std. Dev	M	Std. Dev
Lack of finances has hindered implementation of our strategic plan	4.28	.847	4.45	.904
Changing enrolment trends in the school has forced us to change the school budget thus affecting implementation of the strategic plan	4.00	.987	3.92	1.118
We have adequate physical resources to facilitate effective implementation of the strategic plan	2.17	.903	2.62	1.372
Some projected sources of funds have changed necessitating changes in the strategic plan	4.10	.955	3.73	1.281
I have come to realize that the strategic plan cannot be implemented the way it was designed	3.83	.874	3.30	1.067
We do have adequate human capacity to implement our strategic plan	3.10	1.105	3.13	1.090
We have enough teaching staff to enable us meet our academic performance targets as set in the strategic plan	2.38	1.192	2.68	1.228
There are adequate instructional materials to support the instructional needs of the school.	3.45	.846	3.18	.844
The government policy on school fees has hindered progress of some projects spelt out in our strategic plan	4.65	.580	4.40	1.128
The school will be able to realize and address all issues within the stipulated time	2.15	.736	2.35	1.122
Overall mean score	3.41	0.90	3.78	1.12

As shown in Table 6, the mean scores obtained by the principals on aspects measuring the influence of resources on implementation of strategic plan ranged from 2.15 to 4.65, while that of the BoM ranged from 2.35 to 4.45. The highly ranked statements by both principals and BoM were “the government policy on school fees has hindered progress of some projects spelt out in our strategic plan (Principals M=4.65 and BoM M=4.40)” and “lack of finances has hindered implementation of our strategic plan (Principals M=4.28 and BoM M=4.45)”. The lowest ranked statements were “the school will be able to realize and address all issues within the stipulated time (Principals M=2.15 and BoM M=2.35)” and “we have adequate physical resources to facilitate effective implementation of the strategic plan (Principals M=2.17 and BoM M=2.62)”. From the study findings, it is clear that resources available in most schools were inadequate for successful implementation of strategic plans. The findings concurred with the results by Kevogo and Waiganjo (2015) who established that implementation of strategic plans in public secondary schools is adversely affected by scarcity of resources (time, human capital and budgetary allocation), presence of idle capacity due to poor flow of resources and inadequate funding of capacity building. Similarly, Amukowa (2017) found out that shortage of resources

such as funding, limited budgetary allocation, Skills, staff training and development, and disbursement of Free Day Secondary Education funds greatly influenced implementation of strategic plans in public secondary schools in Khwisero sub-county. Yabs (2010) in his study on strategic management practices in Kenya emphasized that without adequate resources the implementation of strategy is almost impossible. He further noted that the success of any school or organization depends to a very large extent on the availability of resources such as people, skill, facilities and money to implement strategy.

To determine the relative influence of resources on the implementation of strategic plans in public secondary schools, the following regression model was developed with strategic plan implementation index as the dependent variable.

$$Y = a_1X_1 + c$$

Where:

Y = Strategic plan implementation index

X₁ = Resources

c = Constant; and a₁ is a regression coefficient

Table 7 depicts the regression model summary.

Table 7: Regression model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.322 ^a	.104	.080	4.34918
a. Predictors: (Constant), Resource				

Table 7 shows an R-square value of 0.104. This implies that resources explained 10.4% of the variation in the implementation of strategic plan.

Table 8 shows the regression coefficients for the model.

Table 8: Regression coefficient for resources versus implementation of strategic plan

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	18.693	4.281		4.367	.000
	Resource	.395	.189	.322	2.096	.043
a. Dependent Variable: Implementation of strategic plan						

Table 8 illustrates that the prediction equation for implementation of strategic plan (Y) becomes:

$$Y = 0.395[\text{Resources}] + 18.693.$$

This means that implementation of strategic plan is predicted to increase by 0.395 when availability of resources goes up by one. In terms of significance level at $p < 0.05$ level of significance, resources had a significant influence on implementation of strategic plan with a p value of 0.043. From this finding, it is clear that resources had a positive influence on the implementation of strategic plans. The findings of this analysis agrees with Abok et al (2013) whose study established that resources play a big role in effective implementation of strategic plans in Non- Governmental Organizations in Kenya. Similarly, Olsen (2017) observes that to successfully implement strategic plan, one need to have sufficient funds and enough time to support implementation. Further, a survey by Buluma et al (2013) found out that human related factors such as inadequate personnel (staffing) were a hindrance to implementation of council's strategic plans. Inadequacy of resource could have played a role in the implementation of strategic plans in public secondary schools from Kakamega County. Probably if the resources were adequate, then implementation of strategic plans would have been successful. From the responses and interview schedule it came out clearly that public secondary schools did not have adequate resources. Having noted the importance of resources in implementation of strategies and their inadequacy, one notes that implementation of strategic plans would not have been successful. This probably explained the overall dismal implementation of strategic plans with an overall implementation mean index of 0.37

which was far below half way implementation index of 0.5 and full implementation index of 1.

V. CONCLUSION

The study established that over 80% of the schools were not funded to develop strategic plans and hence they were not able to implement strategic plans as intended. Regression analysis model revealed an R-square value of 0.104 which implied that resources explained 10.4% of the variation in the implementation of strategic plans. From the findings, implementation of strategic plan was predicted to increase by 0.395 when availability of resources goes up by one. In terms of significance level at $p < 0.05$ level of significance, resources had a significant influence on implementation of strategic plans with a p value of 0.043. This implied that schools with adequate resources were more likely to have successful implementation of strategic plans than those with inadequate resources. From the study findings therefore, Resources had a significant influence on the implementation of strategic plans. However, these resources were not adequate to enhance implementation of strategic plans in public secondary schools from Kakamega County and this probably was an explanation to their overall implementation mean of 0.37 that was far below half way in the implementation of strategic plans. Arising from the study findings therefore, in order to ensure successful implementation of strategic plans in public secondary schools in Kakamega County, Kenya, sufficient resources should be allocated to schools.

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Real time alert system in Smart Home

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DOI: 10.29322/IJSRP.10.09.2020.p10580

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10580>

Abstract- The human's aspiration has always been to ease daily responsibilities. With the grow and the advancement of the technology their facilitation and automation are enabled. Nowadays, smart homes are becoming popular, with which everyone can almost forget the daily responsibilities in their home. Smart home is a system that includes multiple aspects of the home and allows their remote control via mobile or web applications. Smart lighting, heating, cooling, home appliance, ventilation, security systems and many more are part of the smart homes. This system brings security, comfort, but also saves energy, time and money. Through mobile applications or software, the user has access to his home at any time and any place. The purpose of this paper is to make a prototype of a smart home security system. It will be equipped with several sensors and a NodeMcu.

Index Terms – Alerts, IoT, NodeMcu, Security, Smart Home

I. INTRODUCTION

The popularity of home automation has been growing steadily in recent years due to increased availability, simplicity, increased quality and comfort of life. The idea of controlling aspects of our homes and allowing certain elements to react automatically to events is becoming increasingly popular and necessary for security and financial purposes. That's why smart home applications are playing an increasingly important role today. With the rapid development of the Internet of Things (IoT), the smart home is increasingly attracting people's attention for improving the quality of life. With the increased economic development, the standard of living increases as well. Modern society requires security, economy and a comfortable life that is ideal for every family. Home automation is a promising idea. The main advantage, apart from increased comfort and safety, is the rational use of energy and other resources, providing significant savings. The construction and automation of these smart homes is real challenge for every engineer.

II. DEFINITION AND HISTORY ABOUT SMART HOME

With the constant growth and progress of telecommunication technology, the Internet-of-Computer era has moved into the Internet-of-Things era (IoT). The Internet of Things (IoT) describes a network infrastructure of identifiable things that share data through the Internet [1]. The IoT is the main part of the idea of connected world. Nowadays, our homes, hospitals, factories, and cities are being enhanced with devices that have computational and networking capabilities. The substantial development activity in IoT includes many categories, such as smart grid, smart logistics, environment and safety testing, intelligent transportation, industrial control and automation, finance and service, military defense, health care, fine agriculture, and smart homes.

The early beginnings of smart home were in 1975 with the release of X10, a communication protocol for smart home. X10 allows products to talk to each other with sending 120 kHz radio frequency (RF) bursts of digital information onto existing electrical wires of a home to programmable outlets or switches. Because of the limitations with the response and the use of electrical wiring x10 was not always reliable. Sometimes the signals would not cross circuits or there would be signal lost. Later a two-way x10 devices were released but with a higher cost.

In 1992 the smart home was defined as the integration of different services within a home by using a common communication system. Berlo et al. introduced automatic control to the definition of smart home [2]. Alam defined a smart home is an application of ubiquitous computing in which the home environment is monitored by ambient intelligence to provide context-aware services and facilitate remote home control [3]. In 2005 the Insteon company released technology that combines electric wiring with wireless signals. Zigbee, Z-Wave and other protocols came to counter the problems of x10.

The main difficult in smart home is the restriction caused by the complicated configurations of the devices and the implementation of the system setups and procedures.

Nowadays, smart home service providers suggest cloud-based backend platforms which provide programming frameworks to achieve better and easier setup and third-party application development. These kinds of frameworks are included in Vera Control's Vera3, Weave/Brillo by Google, HomeKit by Apple, SmartThings by Samsung, AllSeen by Alliance AllJoyn, etc.

III. SMART HOME SECURITY

One of the main branches of the smart home is security. The smart home cannot be complete without security part. Without security the comfort and safety in the home that everyone desire cannot be achieved. Conventional security systems keep homeowners, and their property, safe from intruders. (Rosslin John Robles1 and Tai-hoon Kim1). Smart home security systems offer many benefits. Fire detection, gas leak detection, water leak detection, camera monitoring, smart lights, alarms, alerting the owner with email, sms and etc. In the event of a fire, the smart home security system can alert the homeowner and notify emergency services. Artificial intelligence programs can find the location of the fire and provide that information to the fire emergency services. Access control, video verification, fingerprint verification and many other are also desired by people nowadays. More than 70 percent of the users of households in USA wanted access control as a feature of their home security. The desired control capabilities for a new smart home security system according to households in the United States as of 2019 are shown in the Fig. 1.0.

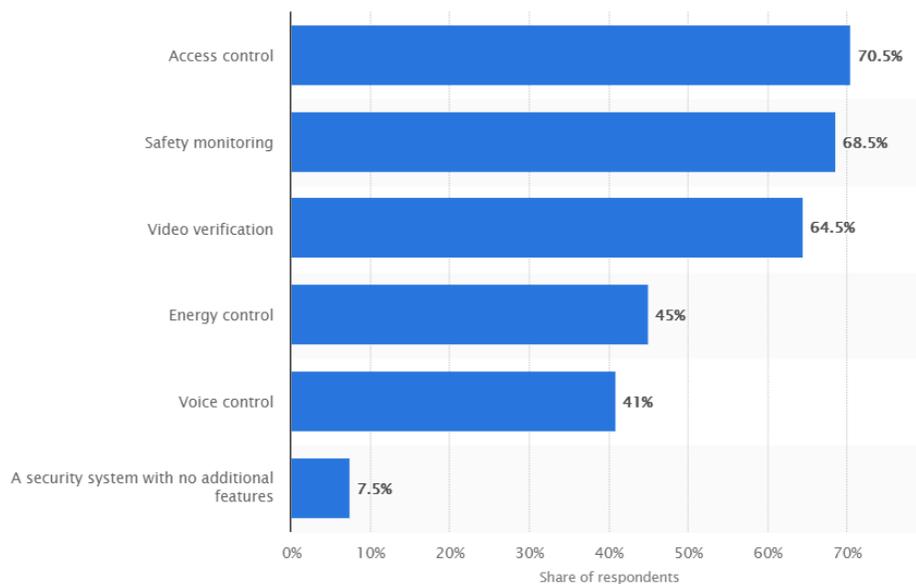


Figure 1.0 The desired control capabilities for a new smart home

IV. REVIEW OF THE PROJECT

As it is mentioned in the introduction, the construction of smart home is real challenge for any engineer. These kinds of projects have been conducted over the last decades. Different functions, utilities and ideas has been provided. That is why our system is inclined on the security in the smart home. The existing security in our smart home system uses gas sensor, fire sensor, water leak sensor, motion sensor and other sensors that use simple analog or digital technology and the data collected from them goes into our system that notifies the owner or the emergency services.

Proposed system

The system proposed is a system for security in Smart home. The system detects fire, gas leak, water leak and motion.

- 1) Gas leak, using MQ-2 sensor;
- 2) Water leak, using water level sensor;
- 3) Fire detection, using flame sensor;
- 4) Alarming, using Buzzer and Led diode.

System architecture

The implemented system contains a NodeMcu board which is used as a main processing unit for the entire system and all the sensors and devices are connected with it. The NodeMcu connects to WiFi and sends the data to ActiveMq through Mqtt protocol. After that the Smart home backend application based on Spring Boot take the data and send it to the GUI part of this Smart home system. The processed data from the sensors is stored for future analysis. Also, the user will be notified about alarm on the GUI part (Admin module). An image of system architecture is shown in Fig. 2.0.

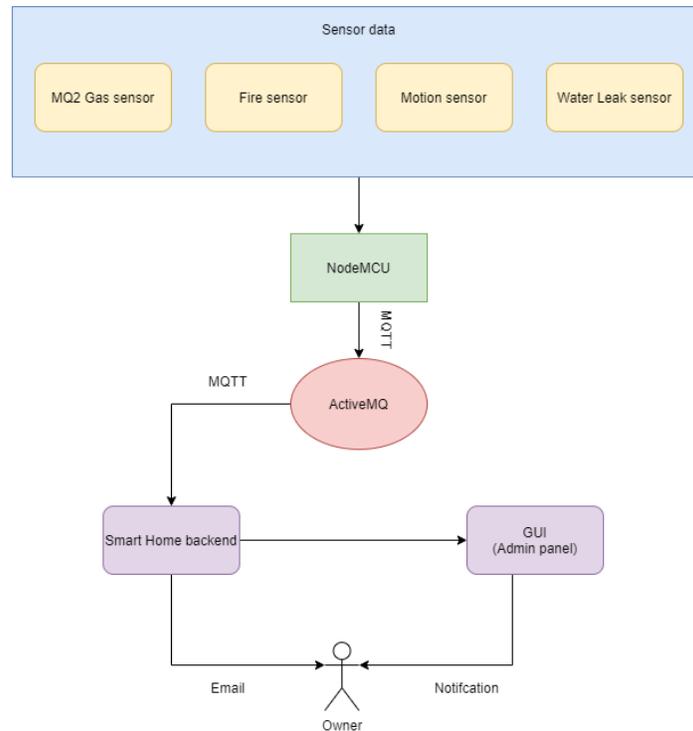


Figure 2.0 System architecture

NodeMcu

NodeMcu (Node micro-controller unit) is an open source IoT platform. It initially included firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems and hardware which was based on the ESP-12 module.

- 1) Type: single board microcontroller;
- 2) Operating system: XTOS;
- 3) CPU: ESP8266;
- 4) Memory: 128 kbytes;
- 5) Storage: 4Mbytes;
- 6) Power: USB or battery with Base Board.

An image of NodeMcu is shown in the Fig. 3.0 below.



Figure 3.0 NodeMcu

Gas Sensor

The Grove - Gas Sensor (MQ-2) module is useful for gas leakage detection (home and industry). It is suitable for detecting Methane, Butane, LPG and Smoke. Due to its high sensitivity and fast response time, measurement can be taken as soon as possible. The sensitivity of the sensor can be adjusted by potentiometer.

- 1) Operating Voltage is +5V;
- 2) Can be used to Measure or detect Methane, Butane, LPG, Smoke;
- 3) Analog output voltage: 0V to 5V;
- 4) Digital Output Voltage: 0V or 5V (TTL Logic);
- 5) Preheat duration is 20 seconds;
- 6) Can be used as a Digital or analog sensor;
- 7) The Sensitivity of Digital pin can be varied using the potentiometer;

Item	Parameter	Min	Typical	Max	Unit
VCC	Working Voltage	4.9	5	5.1	V
PH	Heating Consumption	0.5	-	800	mW
RL	Load Resistance		Adjustable		
RH	Heater Resistance	-	33	-	Ω
Rs	Sensing Resistance	3	-	30	k Ω

Figure 4.0 Specifications of Gas Sensor

When the sensor detects gas leak, the NodeMcu creates alarm and send message to the user. An image of MQ2 sensor is shown on Fig. 4.1 below.



Figure 4.1 MQ2 Sensor

Flame Sensor

A sensor which is most sensitive to a normal light is known as a flame sensor. That's why this sensor module is used in flame alarms. This sensor detects flame otherwise wavelength within the range of 760 nm – 1100 nm from the light source. This sensor can be easily damaged to high temperature. This sensor can be placed at a certain distance from the flame. The flame detection can be done from a 100cm distance and the detection angle will be 600. The output of this sensor is an analog signal or digital signal.

The features of this sensor include the following.

- 1) Photosensitivity is high;
- 2) Response time is fast;
- 3) Simple to use;
- 4) Sensitivity is adjustable;
- 5) Detection angle is 600;
- 6) It is responsive to the flame range;
- 7) Accuracy can be adjustable;
- 8) Operating voltage of this sensor is 3.3V to 5V;
- 9) Analog voltage o/ps and digital switch o/ps;
- 10) The PCB size is 3cm X 1.6cm;
- 11) Power indicator & digital switch o/p indicator;
- 12) If the flame intensity is lighter within 0.8m then the flame test can be activated, if the flame intensity is high, then the detection of distance will be improved.

When the sensor detects fire, the NodeMcu creates alarm and send message to the user. An image of flame sensor is shown on Fig. 6.0 below.



Figure 5.0 Flame Sensor

Water Leak Sensor

The working of the water level sensor is pretty straightforward. The series of exposed parallel conductors, together acts as a variable resistor (just like a potentiometer) whose resistance varies according to the water level. The change in resistance corresponds to the distance from the top of the sensor to the surface of the water. The resistance is inversely proportional to the height of the water:

- 1) The more water the sensor is immersed in, results in better conductivity and will result in a lower resistance.
- 2) The less water the sensor is immersed in, results in poor conductivity and will result in a higher resistance.

The sensor produces an output voltage according to the resistance, which by measuring we can determine the water level.

Sensor specifications:

- 1) Operating voltage: DC3-5V;
- 2) Operating current: less than 20mA;
- 3) Sensor Type: Analog;
- 4) Detection Area: 40mmx16mm;
- 5) Operating temperature: 10°C-30°C;
- 6) Humidity: 10% -90% non-condensing;

This sensor is used to prevent water leak. When the level of water gets higher, the NodeMCU create alarm and send message to the user. An image of Water leak Sensor is shown on Fig. 7.0 below.



Figure 6.0 Water leak Sensor

Motion Sensor

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and don't wear out. For that reason, they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors.

- 1) Size: Rectangular
- 2) Output: Digital pulse high (3V) when triggered (motion detected) digital low when idle (no motion detected). Pulse lengths are determined by resistors and capacitors on the PCB and differ from sensor to sensor.
- 3) Sensitivity range: up to 20 feet (6 meters) 110° x 70° detection range
- 4) Power supply: 5V-12V input voltage for most modules (they have a 3.3V regulator), but 5V is ideal in case the regulator has different specs

The PIR sensor is used to detect motion in front of the smart home. After it detects motion, the lights turn on and the alarm gets activated. An image of PIR sensor is shown in Fig 8.0 below.



Figure 7.0 PIR Sensor

Buzzer

A buzzer is a small efficient component to add sound features to our project/system. It is very small and compact 2-pin structure hence can be easily used on breadboard. When sensors above detect fire, gas leak, water leak or unattended access at home, the system activate the buzzer to make noise as alarm.

Buzzer Features and Specifications:

- 1)Rated Voltage: 6V DC;
- 2)Operating Voltage: 4-8V DC;
- 3)Rated current: <30mA;
- 4)Sound Type: Continuous Beep;
- 5)Resonant Frequency: ~2300 Hz;
- 6)Small and neat sealed package;
- 7)Breadboard and Perf board friendly.

An image of buzzer is shown on Fig. 8.0 below.

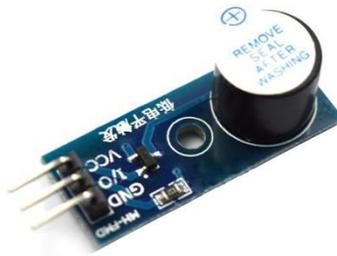


Figure 8.0 Buzzer

Led diode

A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. When buzzer get activated, the led diode gets active too and start to blink. An image of led diode is shown on Fig. 9.0 below.



Figure 9.0 Led diode

V. FEATURE WORK

The current system is not complete, and it has some limitations. But with feature work use cases it will become a perfect solution for smart home security. In the feature work we want to make more about access security. The first thing is Authentication for access with face recognition and fingerprint. The next feature is with the motion sensor and the camera. When motion sensor detects some motion, it will trigger the camera to take a picture.

VI. CONCLUSION

Without security, the comfort and safety in the home that everyone desire cannot be achieved. As we mentioned above, smart home security systems offer many benefits like fire detection, gas leak detection, water leak detection, camera monitoring, smart lights, alarms, alerting the owner with email, sms etc. The results obtained were satisfactory and can be further improved. No smart home is really “smart” without well implemented security solution.

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Energy efficiency in smart home system

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DOI: 10.29322/IJSRP.10.09.2020.p10581

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10581>

Abstract- With the advancement of technology, we are constantly striving to automate processes that would make everyday life easier and at the same time reduce daily costs. So today there are smart homes that aim to reduce daily obligations and costs, and at the same time increase the safety and comfort of home. Smart Home technology is a general term that refers to homes that have comforts related to communication technologies, enabling automatic or remote controls. Smart Home offers opportunities to save energy and reduce costs, improve the quality of life and increase security. Home and building automation provide comfort, security, energy savings, flexibility and adaptability to future development. The purpose of this paper is to make a prototype of a smart home. It will be equipped with several sensors and a NodeMcu.

Index Terms- Energy Efficiency, IoT, NodeMcu, Smart Home

I. INTRODUCTION

The idea of a smart home has been growing steadily in recent years. In 1992, Lutolf provided the first definition for a smart home [1]. According to Lutolf, “the smart home concept is the integration of different services within a home by using a common communication system. It assures an economic, secure, and comfortable operation of the home and includes a high degree of intelligent functionality and flexibility.”

Building automation solutions and management are a real challenge for engineers. Improving the overall energy efficiency of a building also depends on the implementation of renewable energy sources and energy storage. Implementation of such technology saves 30-40% energy and reduces emissions. Technological advances in the way energy is utilized and equipment installed require high quality and accuracy.

II. ENERGY EFFICIENCY

Energy efficiency is performing the same or a larger amount of activities with the same or a smaller amount of energy consumed (heat, electricity) and with a lower emission of carbon dioxide into the atmosphere.

Inefficient use of electricity increases in proportion to the increase in electricity consumption, increased activity in the economy and the use of outdated technology.

In addition, this increases the adverse environmental impact and consumes resources that cannot be recovered, and the next generations will not have adequate access to them.

Energy efficiency brings great benefits in everyday life:

- 1) reducing the need for energy imports;
- 2) more efficient heating and cooling;
- 3) saving money;
- 4) better environment;
- 5) reducing the risk of various diseases caused by harmful substances, which are a result of energy production;
- 6) increase the number of jobs;
- 7) increasing the use of renewable energy sources.

Using a smart home for energy efficiency can save costs so far, which means that investments to increase energy efficiency pay off.

III. SYSTEM ARCHITECTURE

The implemented system consists of a NodeMcu which is used as a main processing unit for the entire system and all the sensor and devices can be connected with the microcontroller. The sensors can be operated by the user through website which collects the data from sensors through mqtt protocol. The system architecture is shown in Fig. 1.0 below.

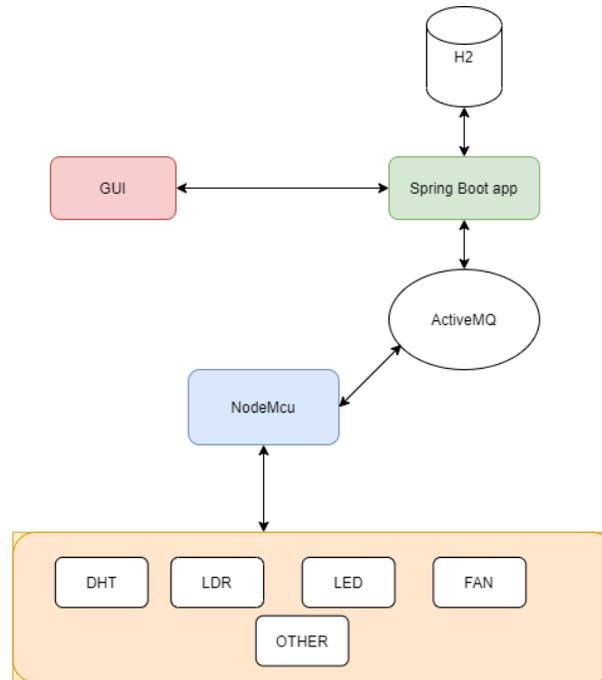


Figure 1.0 System Architecture

Sensors and devices are connected to NodeMcu which communicates with Spring Boot application through ActiveMq broker via mqtt protocol. From the GUI we can control the devices and monitor their measures.

NODEMCU

NodeMcu is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP12 module. It will be used as main processing unit for the entire system and sensors. An image of NodeMcu is shown in Fig. 2.0 below.

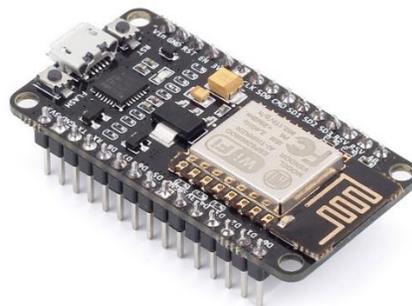


Figure 2.0 NodeMcu

Sensors:

- 1) The humidity and temperature of the room are measured by DHT11 sensor. The DHT11 is a digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin. An image of DHT11 is shown in Fig. 3.0 below.

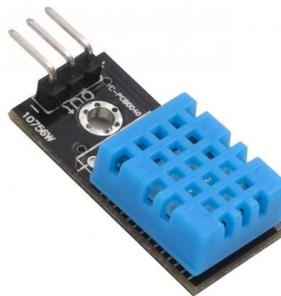


Figure 3.0 DHT

- 2) Light dependent resistor is a component that is sensitive to light. When light falls upon it then the resistance changes. It will be used to measure the outdoor light. When there is enough brightness that can light up the yard, the system will automatically turn off the lights. An image of LDR is shown in Fig 4.0 below.

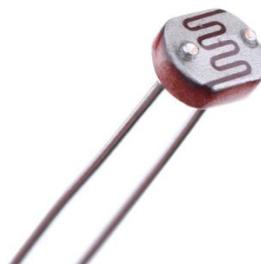


Figure 4.0 LDR

- 3) A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. It will be used to represent the light. When the system receives measurements that there is enough light then the led will be automatically turned off. An image of LED is shown in Fig. 5.0 below.



Figure 5.0 LED

- 4) The maintenance of the temperature in the home will be through an 3V DC motor and fan. An image of FAN is shown in Fig. 6.0 below.

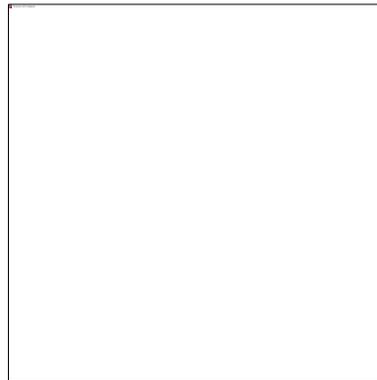


Figure 6.0 FAN

- 5) The reed switch is an electrical switch operated by an applied magnetic field. An example of a reed switch application is to detect the opening of a door, windows, when used as a proximity switch for a security alarm. An image of Reed Switch is shown in Fig 7.0 below.

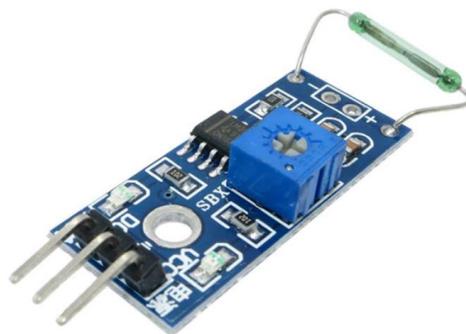


Figure 7.0 Reed Switch

GUI

This web application is made with Angular and communicate with Spring Boot application through Rest API and WebSocket's. Through this GUI we can control our home and devices. For example, if we turn on the light, then the system sends request to the spring boot application. This web application also represents an analytical module where several calculations and graphs are presented.

Spring boot application

This application is for controlling, calculation and analytics for the data from the sensors. In this application we have the state of every sensor and device stored in h2 database. Calculations and analytics are also saved in h2 database. The application communicates with the GUI through REST API and WebSocket's, and it communicates with NodeMcu via Mqtt protocol through ActiveMq.

ACTIVEMQ

ActiveMQ is an open source protocol developed by Apache which functions as an implementation of message-oriented middleware (MOM). Its basic function is to send messages between different applications. In the system it is used as a message broker between all components.

IV. IMPLEMENTATION

For achieving energy efficiency, we have several use cases:

- 1) If the FAN is active and some window is opened, then the "smart home" will close the window. Then it will send notification to our system where it will count the energy savings.
- 2) If there is no motion in the room after some period, the system will turn off the light.
- 3) When there is enough brightness that can light up the yard, the system will automatically turn off the lights.
- 4) When there is enough brightness outside that can light up the room, the system will turn off the lights in the room.
- 5) When it is cheap electricity time then the system will notify the user to turn on the laundry and other stuffs.

On this Figure 8.0 below we can see that we can pick some date range and see the status of our energy efficiency for that period. The price for the kWh is used from North Macedonia electricity provider which is 4.44 denars.

The result:

- 1) Total money saved
- 2) Total money spent
- 3) Total kWh saved
- 4) Total kWh spent



Figure 8.0 Results

V. CONCLUSION

Heating and cooling costs are the #1 expense in most homes. Naturally, it's the first place many homeowners look to cut costs. What they should do is figure out how to use energy more efficiently, while at the same time achieving the comfort, health, and home protection benefit. There are many motivations to improve energy efficiency. The reducing of the energy consumption may result in a financial cost saving to consumers if the energy savings offset any additional costs of implementing an energy-efficient technology. In this paper we have presented a project for smart home energy efficiency. The results obtained were above satisfactory and can be further improved by adding more devices and adding voice commands.

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Binocular Vision-Based Intelligent 3-D Perception for Robotics Application

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DOI: 10.29322/IJSRP.10.09.2020.p10582
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10582>

Abstract- Vision-based robotics has been the subject of several research contributions in the area of vision and control. Vision technology is becoming a pioneer in the most common applications such as localization, automated map creation, autonomous navigation, mapping analysis, or risk pattern prediction. The Stereo applications or programs use pairs of 2-D images as inputs and generate reconstructed 3-D imagery by locating the matching points. This paper introduces a method to the development of an algorithm of intelligent 3-D view reconstruction using the binocular vision for the robotic applications. The proposed system consists of two identical colour cameras and cameras were mounted as one stereo camera. 3-D reconstruction and visualization were performed according to the pair of 2-D images. Calibration, multi-view image acquisition, the stereo rectification process, and the disparity process were discussed in Section II. Real-time captured images and stereo image from Middlebury Stereo Datasets were used to test the system and verify results in Section III.

Index Terms- 3-D Depth Map, 3-D Reconstruction, Disparity Map, Feature Extraction, Stereo Matching, Stereo Vision

I. INTRODUCTION

Machine stereo vision, or also known as the stereoscopic vision has been an active area of robotics and engineering research for decades. It has been widely investigated before the emergence of event-based sensors. An autonomous robot needs to be aware of the three-dimensional state of the world to understand and think for its environment. However, the problem with vision is that the perceived image is a two-dimensional 3-D world projection [1]. Stereo vision must be viewed as a spatial integration of multiple viewpoints to recover depth, and a temporal integration is also possible.

Biology understands a scenario more easily than machines, even at smaller energy budgets (Martin *et al.*, 2018). Most animals have two eyes for a reason. Through eye's vision is combined in a stereoscopic reality that becomes a 3-D map of the human brain. Vision from each eye is only slightly different to a certain degree, and this variation is what helps us to perceive that anything is closer or farther away. In humans, stereopsis has become an attractive model system for understanding the neural activity-perception relationship (Roe *et al.*, 2007). Stereopsis has not been seen behaviorally in any non-human animal until 130 years after Wheatstone, with evidence of stereopsis by Bough in 1970 in macaque monkeys.

Modern machine's stereo algorithms are, to some extent, inspired by human stereopsis, which is powerful but also complicated and expensive [2]. Figure 1 illustrates the typical stereo vision system of a human. Stereo vision suggests numerous points of view and coordinating; thus, it gets profundity from a couple of pictures. Calculations for stereo system vision are additionally utilized prosperously in robotics [3].

Every visual sensor, whether artificial or biological, maps a 2-D representation of 3-D worlds. Depth sensors are the key to unlocking next-level machine vision applications in modern engineering. 3-D depth calculation and machine vision techniques are widely accepted in many applications, such as healthcare applications [4-8], autonomous navigation, teleoperation, or virtual/augmented reality modelling [9]. Google's Project Tango uses depth sensors to measure the real environment accurately and inform its graphics algorithms to virtual position content in the appropriate locations. Many warehouses are now using fully autonomous vehicles to carry items from one place to another. The vehicle's ability to travel on its own includes depth-sensing so it can know where it is in the world, where other important objects are, and most importantly how it can get from point to another point safely.

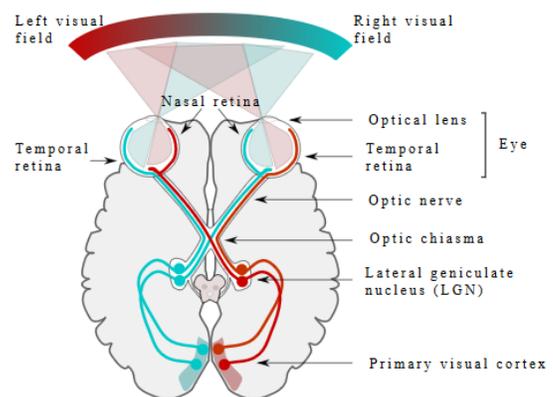


Figure 1. Stereo Vision System of Human [10]

Basic of Stereo Vision

Stereo technology takes 2-D picture stereo pairs as input and generates the replicated 3-D images by locating the respective positions. Most methods of stereo reconstruction are based on the use of model pinhole camera and parallel geometry.

Therefore, given that any stereo matching process identifies two locations of points, the depth is calculated from the different points or the distinction of the two points in the picture pixel coordinates.

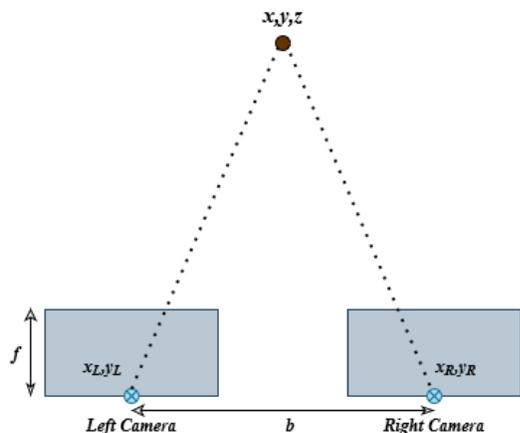


Figure 2. Illustration of the Stereo Geometry

Given the pixel coordinate (X_L, Y_L) at the left and (X_R, Y_R) at the right images, the coordinates of the 3-D universe (X, Y, Z) are determined as,

$$X = \frac{X_L b}{d}, Y = \frac{Y_L b}{d}, Z = \frac{fb}{d} \tag{1}$$

Where,

$d = (X_L - X_R)$ in pixel, $f =$ Focal length of the camera,
 $b =$ the parallax or interocular separation of camera (mm) ,

3-D performance of data reconstruction depends on the quality of the disparities, calibration, image rectification, and overall stereo system architecture. Figure 3 depicts the 3-D reconstruction model of the proposed system.

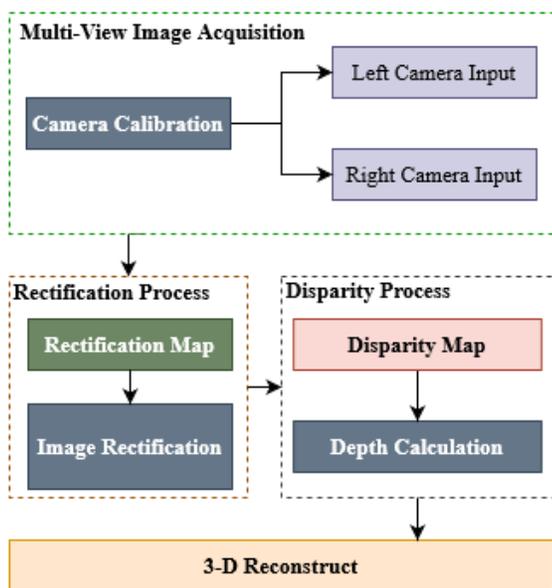


Figure 3. The Architecture of the 3-D Reconstruction Model

Image rectification

Methods of rectification are well known and have been studied extensively for years. These techniques are aimed at adjusting the captured images to simplify the problem of stereo correspondence. According to the optics, the resulting image varies from the real world geometry when the image is captured using an optical camera. Generally, there are two variables to be modified in stereo applications: image distortion and image epipolar geometry. This is known as the rectification process. If the stereo pair of images is fixed, then the problem of stereo correspondence simplifies and reduces from a 2-D search of order N^2 to a 1-D search of order N^1 for each matching pair of points on the same epipolar line [11].

Epipolar Geometry

Epipolar geometry is the geometry of the Stereo-Vision system. In case two cameras view a 3-D scene from two separate locations, there is an array of spatial relations between the 3-D focuses and their projections into the 2-D pictures resulting in imperatives between the focuses of seeing. These relations are established from the preface that the demonstrated pinhole device should surmise the cameras. Figure 4 illustrates the example of Epipolar Geometry.

Let us assume that the first camera is aligned with the world reference system with the second camera offset first by a rotation R and then by a translation T . This sets out the matrices for the image projection to be:

$$M = K[I \ 0], M' = K'[R \ T] \tag{2}$$

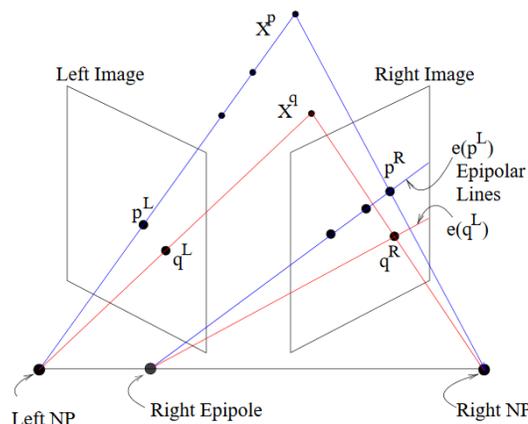


Figure 4. Epipolar Geometry

Let (u, v) be the pixel coordinate of the colour image; (X_C, Y_C, Z_C) is the corresponding coordinate in the colour camera coordinate system [12] Based on the principle of small hole imaging,

$$\begin{bmatrix} u \\ v \end{bmatrix} = \begin{bmatrix} \frac{1}{dx} & 0 \\ 0 & \frac{1}{dy} \end{bmatrix} \begin{bmatrix} f & 0 \\ 0 & f \end{bmatrix} \begin{bmatrix} X_C \\ Y_C \\ Z_C \end{bmatrix} + \begin{bmatrix} c_x \\ c_y \end{bmatrix} \tag{3}$$

Here, f is the focal length of the colour camera; (c_x, c_y) are the coordinates of the principal point. d_x and d_y are physical sizes of the pixel in the horizontal and vertical directions, respectively.

Define $f_x = \frac{f}{d_x}$, $f_y = \frac{f}{d_y}$

$$\begin{bmatrix} u \\ v \\ 1 \end{bmatrix} = \begin{bmatrix} f_x & 0 & c_x \\ 0 & f_y & c_y \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X_c \\ Y_c \\ Z_c \end{bmatrix} \quad (4)$$

Here f_x, f_y, c_x, c_y are the internal parameters of the colour camera.

II. METHODOLOGY

This study aims to develop an algorithm of intelligent 3-D view reconstruction using the binocular vision for machines and robotic applications. The methodology of the proposed system composed of calibration, image acquisition, pre-processing, stereo rectification, point-cloud generation, 3-D reconstruction, and visualization. Figure 5 illustrates the program flow chart of the proposed system.

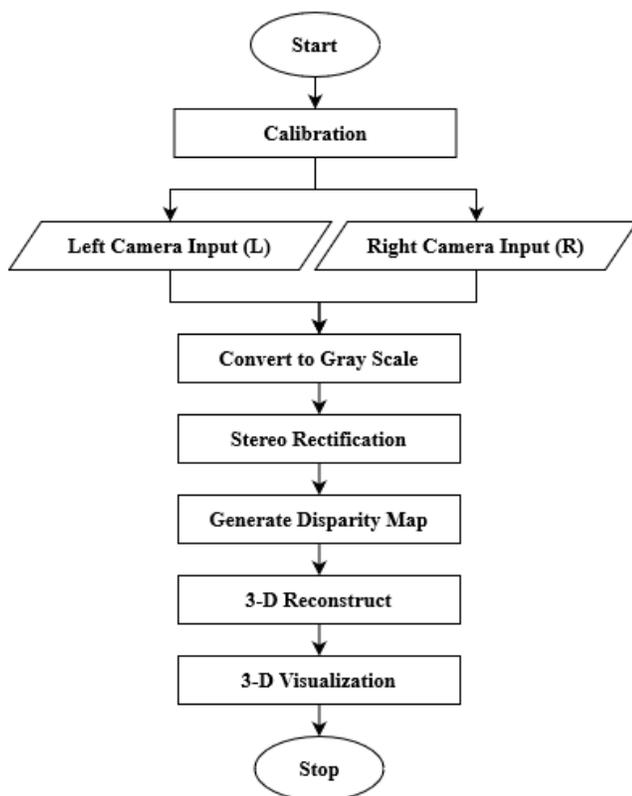


Figure 5. Algorithm Flow-Chart

Image Acquisition:

The proposed system was comprised of two optical cameras (*Raspberry Pi 5MP camera module, 60fps, 640×480 Pixels*), positioned as a single stereo camera parallel to it. The system's

most significant necessity is to guarantee that the frame of both cameras is recorded concurrently with the same brightness, exposure, shutter time, and parameters acquired. There are some methods of multiple-camera calibration which can overcome the adjustment of cameras for intrinsic and extrinsic parameters at the same time. Using pinhole cameras with nonlinear radial and tangential distortion compensation and the python language was used to develop calibration algorithms.

Grayscale Conversion:

In this study, acquired images were converted into grayscale and then passed results to the stereo rectification process. Grayscale is the set or range of monochrome (*gray*) shades that range from pure white on the lightest end to pure black on the other end. Grayscale includes only information about luminance (*brightness*) and no information about colours [13-14]. That's why the highest luminance is white, and the minimum luminance is black; the shade of gray is everywhere in between. Therefore, grayscale images contain only shades of gray and no colours. In this study, acquired stereo images were converted into the grayscale using the weighted grayscale method.

- **Unweighted:** We simply take on average the red, green, blue pixel data in this case. There's no bias, and there's no connection with human vision [15].

$$pixel [gray] = pixel ([red] + [green] + [blue]) / 3 \quad (5)$$

- **Weighted:** In this scenario, we take into account the human eye's sensitivity factor in different colours and set the bias to the average as a result [15].

$$pixel [gray] = pixel ([red] \times 0.299 + [green] \times 0.587 + [blue] \times 0.144) \quad (6)$$

Stereo Rectification:

Methods of rectification are well known and have been practised widely for years. These techniques are designed to adjust the captured images to quantify the analysis of stereo correspondence. Due to the lenses, the resulting image varies from the real world geometry as an optical system takes the image. For stereo implementations, there are essentially two variables that must be modified, such as image distortion and image epipolar geometry. In this study, Image rectification was performed in the mage calibration process.

Finding the Disparity (Sum of Added Differences):

The Sum of Added Differences (*SAD*) is a way to determine the disparity. Since the images are represented as 2-D arrays, it will be associated with any block of $(m \times n)$ pixels. If all of the pixels match perfectly, then all of the colour values associated with each pixel is the same. Then the two blocks are going to be identical. But, in stereo pairs, these identical pairs don't occur so we need to search for the block that has the closest match. It will teach how to obtain measurements of the SAD.

$$m \times n \text{ Array for Right Block} = \begin{bmatrix} a_{11} & \dots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{m1} & \dots & a_{mn} \end{bmatrix} \quad (7)$$

$$m \times n \text{ Array for Left Block} = \begin{bmatrix} b_{11} & \dots & b_{1n} \\ \vdots & \ddots & \vdots \\ b_{m1} & \dots & b_{mn} \end{bmatrix} \quad (8)$$

$$SAD = \sum_{i=1}^n \sum_{j=1}^m (a - b)_{i,j} \quad (9)$$

$$SAD = \begin{bmatrix} (a - b)_{11} & \dots & (a - b)_{1n} \\ \vdots & \ddots & \vdots \\ (a - b)_{m1} & \dots & (a - b)_{mn} \end{bmatrix} \quad (10)$$

Mapping the Disparity in Three Dimensions:

To obtain measurement points, it is important to determine a disparity map before constructing an occupancy grid through stereo-vision. When the magnitude of the disparity increases, the warmth of colour grows proportionally. The height, width of the image are the x , y axes and each combination (x, y) represents every pixel in the image. Those pixels in the map displays the disparity which was simply a numerical representation of how close the pixel is to the camera. Finally, the distance information was plotted in the z -axis and plotted against the coordinates x and y (figure 6).

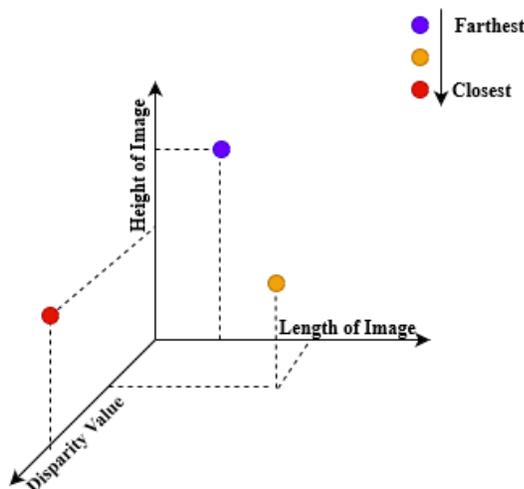


Figure 6. Disparity Visualization in Three Dimensions

Generating Point Cloud:

Point clouds are a means of assembling a significant number of single spatial measurements (x , y , and z) into a dataset that can then represent a whole (*object or space*). Figure 7 illustrates a sample point cloud image of a Torus. Such points represent the geometric coordinates of a single point on a sampled surface underlying the x , y , and z . Several formats may be used to store a cloud of data. Essentially, any format which can store three

numbers representing the coordinate x , y , and z can be used. Many formats are widely used for processing point clouds, however. These formats can be classified into Binary and ASCII types [16].

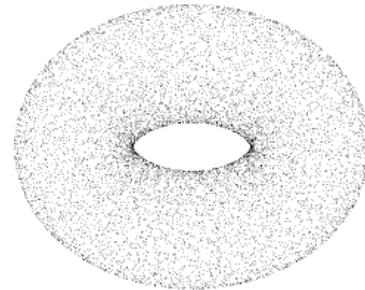


Figure 7. A Point Cloud Image of a Torus [17]

3-D Visualization:

MeshLab [18] is an open-source program that is widely used for 3-D triangular mesh creation and editing. It provides a set of tools that can be used to edit, clean, heal, inspect, render, texture, and convert meshes. In this study, we were used MeshLab to 3-D visualization based on the point cloud dataset, which generated in the point cloud generation process.

III. RESULTS AND DISCUSSIONS

In this section, we were demonstrated depth map results using four image sets from two categories.

- **Category 1:** Experiment one was conducted in this segment, and the image was captured in real-time using two cameras that were functioned as a single stereo camera. The image shown in figure 8 and figure 9 is a man sitting on a chair with his left hand holding a helmet.

Experiment One

Figure 8 and figure 9 illustrate the left and right images acquired by two cameras in experiment one. The yellow horizontal line on the left and right image represents the epipolar line. A patch was marked on the left image's epipolar line, as shown in Figure 8.

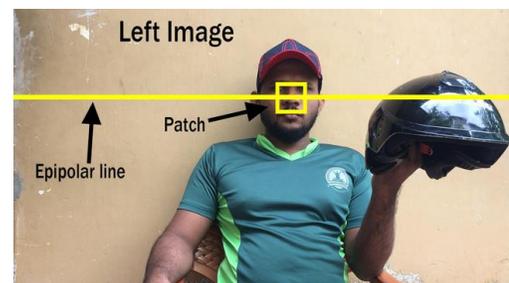


Figure 8. Acquired Left Image of Experiment 1

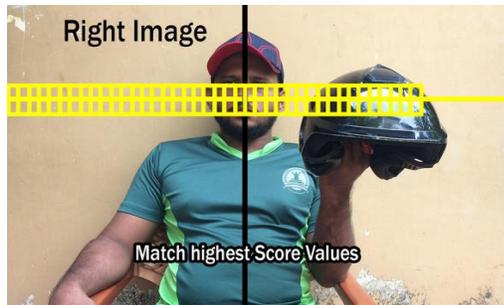


Figure 9. Acquired Right Image of Experiment 1

- **Category 2:** Three stereo images from 2005[19] and 2014 [20] Middlebury Stereo Datasets, which is publically available for researchers in *vision.middlebury.edu* [21-22] was used for this category.

Experiment Two

Experiment two was carried out by using a Middlebury stereo image, as shown in figure 12. The depth map for the second experiment is shown in figure 13.

In the stereo matching process, the algorithm for a corresponding point is not searched for the entire 2-D right image. The “epipolar constraint” reduces the search space to a one-dimensional line. The patch in the left image was compared with the patches along the same row in the right image.

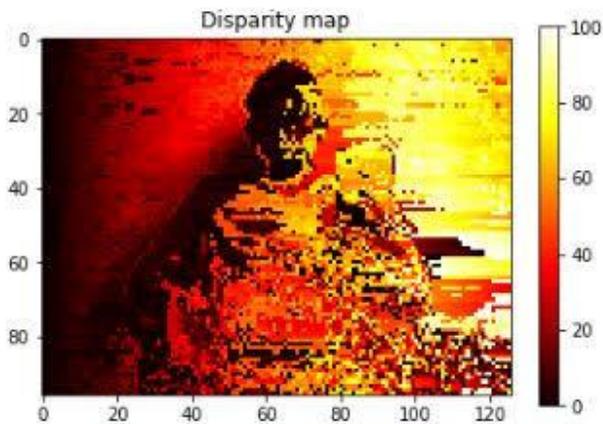


Figure 10. Disparity Map of Experiment 1

To achieve measurement points, it is important to determine a disparity map before constructing an occupancy grid through stereo-vision. Figure 10 illustrates the disparity map of the test one.

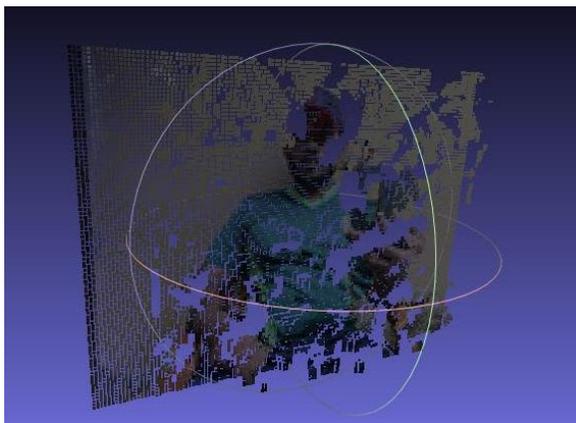


Figure 11. 3-D Visualization of Experiment 1

Figure 11 illustrates the 3-D reconstruction of the stereo image acquired by experiment one. 3-D visualization was archived through the point cloud generation.



Figure 12. Stereo Image of Experiment Two



Figure 13. Depth Map of Experiment 2

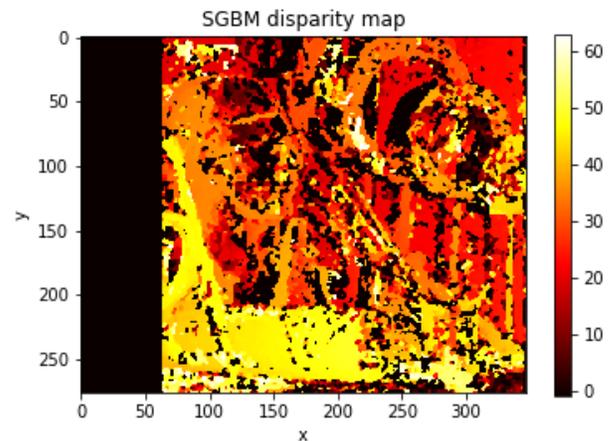


Figure 14. Disparity Map of Experiment 2

As shown in figure 13, the differences between the two images give depth information. This depth information is visualized as the depth map. Due to the low patch values disparity map for the second test was reduced it's detailed as shown in figure 14. Close objects were resulted in a large disparity value. This is translated into light greyscale values and objects further away will appear darker.



Figure 15. 3-D Visualization of Experiment 2

Experiment Three

Figure 16 to Figure 19 is a representation of the stereo image, depth map, disparity map, and 3-D visualization of experiment three.



Figure 16. Stereo Image of Experiment 3

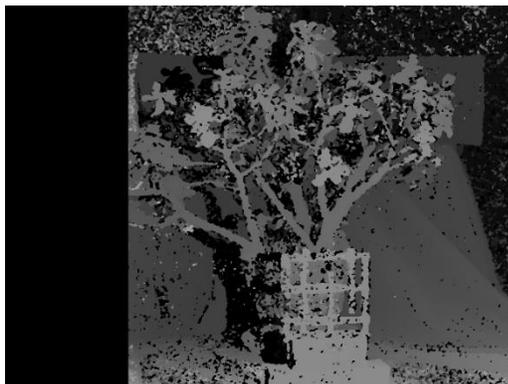


Figure 17. Depth Map of Experiment 3

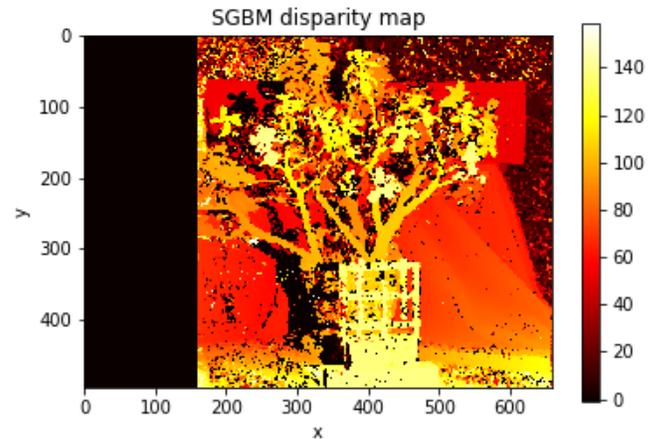


Figure 18. Disparity Map of Experiment 3

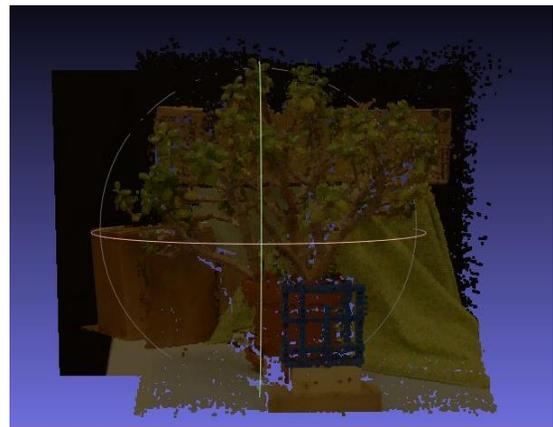


Figure 19. 3-D Visualization of Experiment 3

Figure 17 depicts the depth map of the third experiment. The image shows more and precise detail. The noise in the image was more prominent at the first observation. After applying more significant patch values, the noise of the image was reduced. But this action was lead to a decrease in the precision and details of the image being constructed.

Experiment Four

Figure 20 to Figure 23 represents the results for experiment four.



Figure 20. Stereo Image of Experiment 4



Figure 21. Depth Map of Experiment 4

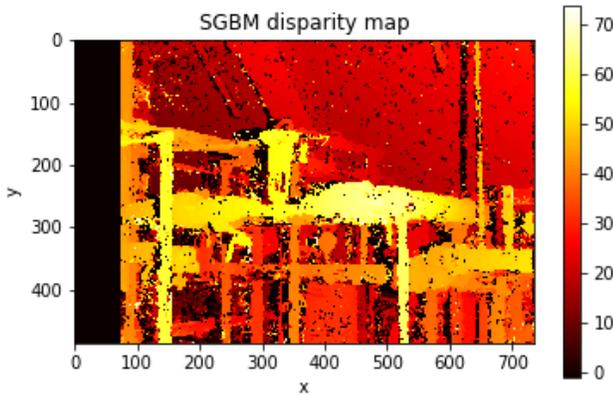


Figure 22. Disparity Map of Experiment 4

Figure 22 illustrates the disparity map for the fourth experiment. Due to the small patch value, large amounts of noise were observed.

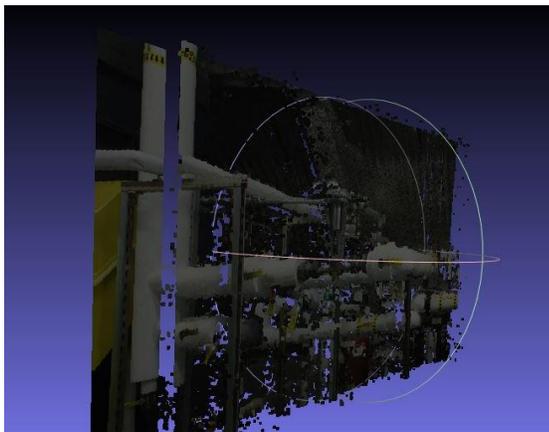


Figure 23. 3-D Visualization of Experiment 4

IV. CONCLUSIONS

In this paper, we presented the development of an algorithm of an intelligent 3-D perception for robotic applications based on the binocular vision using two identical cameras. Stereo imaging is a passive technique that can restore the environmental structure by comparing the features observed in different photographs of the same scene. This algorithm can be used utilizing robotic hands which are guided by visual perception for instruments equipped for handling devices.

These experiments are used two identical cameras which were mounted as a single camera to get a standard epipolar line. Stereo matching is the most crucial step in binocular vision reconstruction. Due to the lack of perfect stereo image acquisition from both cameras, the 3-D visualization was not correctly completed in experiment one. The cloud point development failed because of the errors caused in the process of calibration and image acquisition.

According to the results, the disparity was larger (brighter) for closer surfaces. Figure 24, 25, and 26 represents the depth (z) against disparity (px) for experiment 2, 3, and 4.

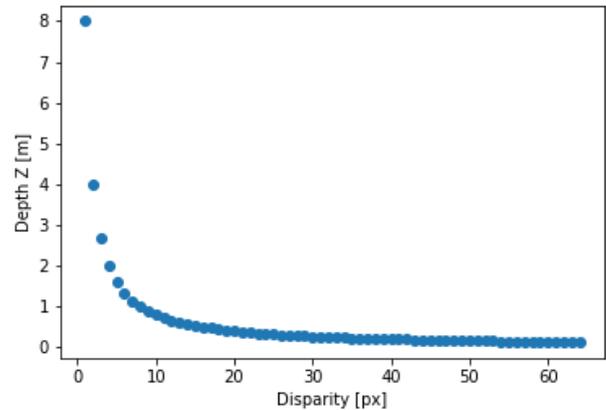


Figure 24. Disparity Vs. Depth of Experiment 2

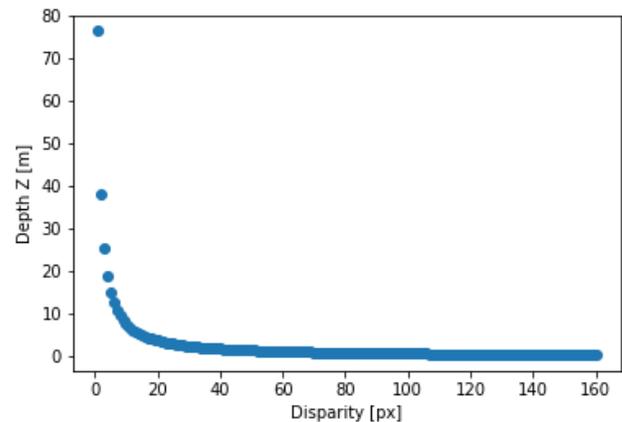


Figure 25. Disparity Vs. Depth of Experiment 3

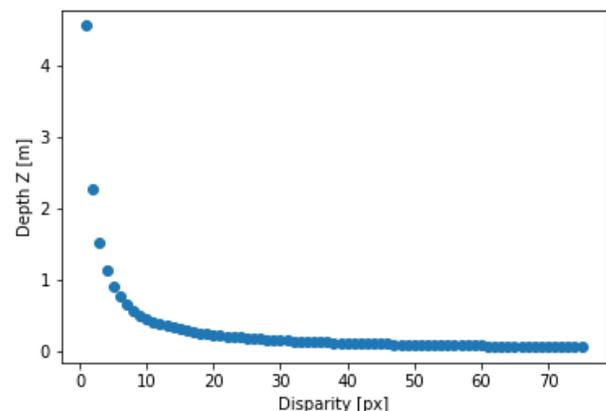


Figure 26. Disparity Vs. Depth of Experiment 4

Table 1 shows the focal length, baseline, and maximum disparity values for experiments 2, 3, and 4, which were observed during the experiments. Each experiment was associated with the stereo images that were taken from the Middlebury stereo dataset.

Table 1. Focal Length, Baseline and Maximum Disparity Values for Experiment 2, 3, and 4

Experiment No	Focal Length /(mm)	Baseline Value /(mm)	Maximum Disparity /(px)
2	50	160	64
3	201	380	160
4	19	237	75

According to the results, some errors were identified due to the camera calibration, low image resolution, occlusion, violations of brightness constancy, large motions, and low-contrast image regions. For this experiment, the use of a single stereo camera is highly recommended. Using two cameras that work as a single camera causes errors in epipolar line development. Hence the 3-D reconstruction development was also not perfect. The author's next step is to minimize the errors and reconstruct 3-D visualization for the development of a laboratory environment for remote laboratory.

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Assessment Of Knowledge Regarding Breast Cancer Among Women Living In Taxila/Wah Cantt

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DOI: 10.29322/IJSRP.10.09.2020.p10583

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10583>

Abstract- Objective: To assess the knowledge regarding breast cancer among women living in Taxila/Wah Cantt.

Study Design: A cross sectional descriptive study was conducted on 200 randomly selected women using a self-administered, structured questionnaire.

Place and Study Duration: It was carried out from January 2019 to June 2019 involving people of Taxila/Wah Cantt.

Materials and Methods: Data was collected through self-structured questionnaire from 200 females living in Taxila. An informed written consent was obtained from all the selected participants. Data was collected through a self-developed structured questionnaire. Participants were requested to respond on the basis of their own opinions and understanding to each question. The collected data was analyzed through SPSS version 19. All collected information was entered and analysis was done through Statistical Package for the Social Sciences (SPSS) version 19.0. To summarize the results the data was presented in the form of percentages and frequencies.

Results: Study results showed that there is a need to create awareness about the breast cancer and motivate for monthly breast self-examination among women of Taxila. Approximately all participants had good knowledge about breast cancer, risk factors, sign and symptoms, but few participants knew about breast self-examination.

Conclusion: Pakistan has one of the highest incidence rates of breast cancer in Asia. Breast cancer is a major contributor towards cancer related mortality and morbidity in Pakistani women. The study results aimed to improve knowledge of women related to breast cancer, its presentation, detection, proper management and treatment of breast cancer.

Index Terms- Knowledge, Breast cancer, Breast self-examination, Screening

I. INTRODUCTION

Breast cancer is a cancer occurring in breast in which abnormal growth of the cells occur. It can occur in any part of the breast as in lobules, ducts and connective tissue. It mainly begins in lobules and ducts. It can also originate outside the breast through blood vessels and lymph vessels. Some studies have reported that some women have risk factors and some have breast cancer without any risk factors. It includes lump in the breast, old age above 50, some gene mutations, family history of breast cancer,

early menstruations below age 12 and late menopause, women who was getting radiation therapy, previous history of breast cancer, overweight, women taking hormones and drinking alcohol.

(Centers for Disease Control and Prevention., 2018).

Breast cancer is the most occurring cancer in women worldwide. An estimated 268,600 women has been diagnosed with breast cancer in U.S. Rarely men get breast cancer the ratio is 1 in 1000 in U.S. Studies showed that cancer spreads in three ways; damaged cells multiply and grow, some hormones and chemicals in the body fasten their growth and lymph and blood vessels circulate these cancer cells to other areas of the body. When cell DNA is damaged, the damaged cells reproduce and form tumor. These cells can lead to cancer in particular part of the body as in breast (National breast cancer foundation, Inc. 2019).

According to World Health Organization breast cancer is increasing both in developed and developing countries. 2.1 million women are suffering from breast cancer each year. It is estimated that in 2018 there were 627,000 women death occur due to breast cancer and it is about 15% of all deaths in women due to cancer. W.H.O. recommended early diagnosis and treatment to improve survival rate. Screening include clinical breast exam and mammography is important at the age of 40-49 or 70-75 without symptoms (World Health Organization, 2019).

A study conducted in Greece showed that breast cancer higher incidence and higher survival rates were observed in European countries. A higher incidence rate was found due to risk factors of breast cancer and higher survival rates in those countries were due to optimal health care and quality of health services. The study also revealed that breast cancer is the most common types of cancer in women in Europe. It is estimated that 29.2% of all cancers in females in 2018. 404,920 cases of breast cancer were reported in females in 2018 in European countries. Breast cancer was the leading cause of death in women in that area (Dafni, U., and Tsourti, Z. 2019).

According to Gorini and *et al* breast cancer is the leading cause of death in Italy and it is estimated that 29% of all cancers in women. Death rate due to breast cancer is decline in recent years due to early diagnosis and treatment. Screening and mammography play a major role in declining the mortality rates of breast cancer. In most areas of Italy advance screening has been started in age of 50-69 at the starts of 2000s. There were about 12,330 deaths arose due to breast cancer in which 34,00 were new

cases and 10,000 cases were those progressed to last stage (Gorini, G., Zappa, M., Cortini, B., et al. 2014).

Another study conducted in India suggested that due to increasing population, lifestyle changes and migration from rural to urban breast cancer rate is increasing in India in the last two decades. 320 participants with newly and confirmed cases of breast cancer were included in the study. The mean age of breast cancer in women in India is 40 and 50 years. The incidence is more among younger women than older and risk factors are low socio-economic status, obesity and dietary changes (Sofi, N. Y., Jain, M., Kapil, U., et al. 2019).

A study conducted in Saudi Arabia showed that breast cancer was increasing in females in recent years. A retrospective cohort study was conducted among cancer patients and data was analyzed. There were 174, 701 cases were reported during 1999-2014 in that region. Breast cancer was found to be in females 98% and 1.7% were males. The strongest association was found between gender, age and Saudi nationality (Jaziah, A.R., Alkattan, K., et al. 2019).

According to Mohsin Khudri and Shariful Islam, they conducted a study in Bangladesh. The study results revealed that 90% women breastfed their babies, some had no previous history of breast cancer, some had benign type breast cancer and only 2% were exposed to radioactive rays that accounts for breast cancer development. 38% women knew about the role of diet in reducing the disease. The study results indicated that the other risk factors were age at menopause, obesity, old age, physical inactivity and family history of breast cancer (Khudri, M., and Islam, S. 2018).

A retrospective study was conducted in Karachi Pakistan. According to this study, Breast cancer is the most prevalent cancer in Pakistan. It was found that Pakistan has the highest incidence rate in breast cancer in the last two decades. It was most commonly occurring at 55-64 years age. It was diagnosed in stage two and less cases were diagnosed in stage one. Study results showed that mortality rate due to breast cancer was high in Pakistan and it was the top ten causes of death in our country. In 2014 age adjusted standardized rate due to this cancer was 29 and worldwide it was 8. The main reason was that screening problem, half of the patients were diagnosed in stage 2 and only 9% were diagnosed in stage 1.

Young women had more incidence rate than older of breast cancer (Somroo, R., Faridi, S., et al. 2018).

According to Rashid and Shumaila, Pakistan is developing country and most of our population are living in rural areas. Illiteracy and poverty are common among people. Most of the women don't have access to medical facilities. So, breast cancer is prevailing day by day. The major reason is detection and diagnosis at an early stage. The study showed that 1 in every 9 women had breast cancer. In Asian countries Pakistan has the highest incidence rate of breast cancer. It showed that the main issue was also the affordability of screening (Minhas, R. and Umar, S. 2015)

II. MATERIALS AND METHODS

A cross sectional descriptive study was conducted on 200 randomly selected women using a self-administered, structured questionnaire. It was carried out from January 2019 to June 2019 involving women living in Taxila/Wah Cantt. Non-probability convenient sampling was carried out among females of reproductive age and were willing to participate. Confidentiality and Privacy of the participant were taken care. The collected information was used for research purpose only. Proper written Consent was taken from all the participants to ensure their voluntary participation. Any risk or harm to the participant was avoided. Participants were requested to respond on the basis of their own opinions and understanding to each question. The collected data was analyzed through SPSS version 19. All collected information was entered and analysis was done through Statistical Package for the Social Sciences (SPSS) version 19.0.

III. RESULTS

Breast cancer is the most common type of cancer in females and the second leading cause of death in women. Approximately all participants had good knowledge about breast cancer, risk factors, sign and symptoms, but few participants knew about breast self-examination.

Socio demographic data of participants

Gender:	Number	Percentage
female	200	100%
Age of the respondent:	Number	Percentage
17-27 years	60	30%
28-37 years	76	38%
38-47 years	46	23%
48-57 years	14	7%
>57 years	4	2%
Marital status:	Number	Percentage
❖ Married	158	79%
❖ Unmarried	38	19%
❖ Widow	2	1%
❖ Divorced	2	1%

Respondent's qualification:	Number	Percentage
❖ Uneducated	18	9%
❖ Primary	12	6%
❖ Middle	20	10%
❖ Matric	46	23%
❖ Inter	32	16%
❖ Graduate	50	25%
❖ Masters and above	20	10%
Number of children:	Number	Percentage
❖ No child	28	14%
❖ 1-3 children	124	62%
❖ 4-6 children	42	21%
❖ >7 children	6	3%
Occupation:	Number	Percentage
❖ House wife	98	49%
❖ Doctor	4	2%
❖ Teacher	26	13%
❖ Others	66	33%

SECTION I: KNOWLEDGE OF WOMEN REGARDING BREAST CANCER

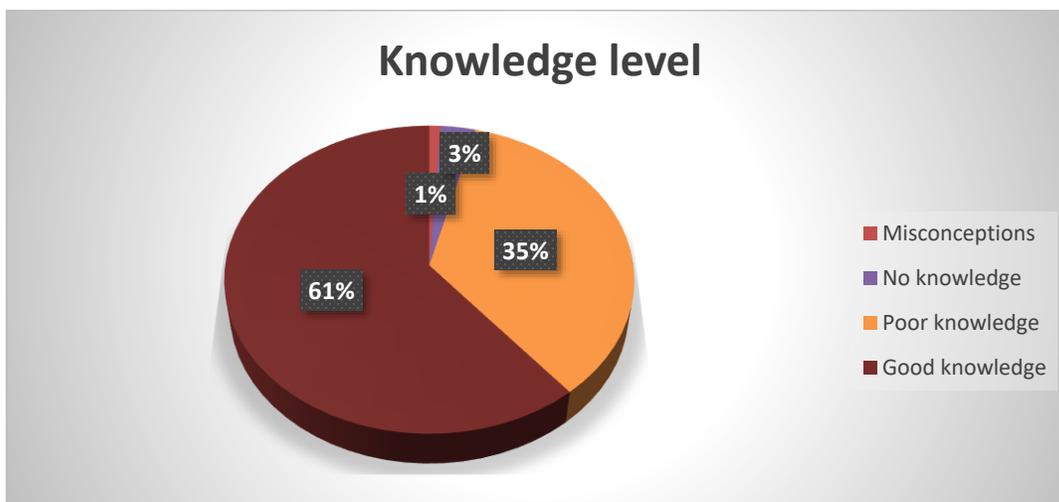
Knowledge Assessment Scale

Knowledge level	Interpretation
Good Knowledge	If the respondents give 60-80% correct answers from the structured questionnaire
Poor Knowledge	If the respondents give < 50% correct answers from the structured questionnaire.

Table 1: Knowledge Level of The Participants about breast cancer

Knowledge level	Frequency	Percentage
Misconceptions	2	1
No knowledge	6	3
Poor knowledge	70	35
Good knowledge	122	61
Total	200	100

Figure 1: Knowledge level of the participants about breast cancer



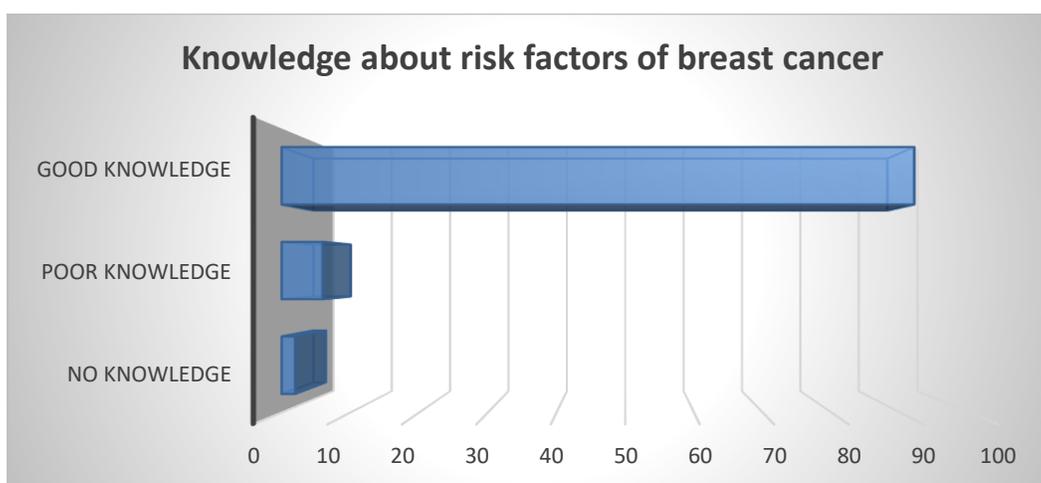
In this section objective of the study assessed the current knowledge of awareness regarding breast cancer among community women of Taxila. According to preselected criteria of knowledge it was concluded that 61% participants demonstrated good

knowledge, 35% had poor knowledge, 3% had no knowledge and 1% had misconceptions about knowledge of awareness regarding breast cancer among women of that area.

Table 2: Knowledge about risk factors of breast cancer

Knowledge about risk factors of breast cancer	Frequency	Percent
No knowledge	4	2
Poor knowledge	12	6
Good knowledge	184	92
Total	200	100

Figure 2: Knowledge about risk factors of breast cancer



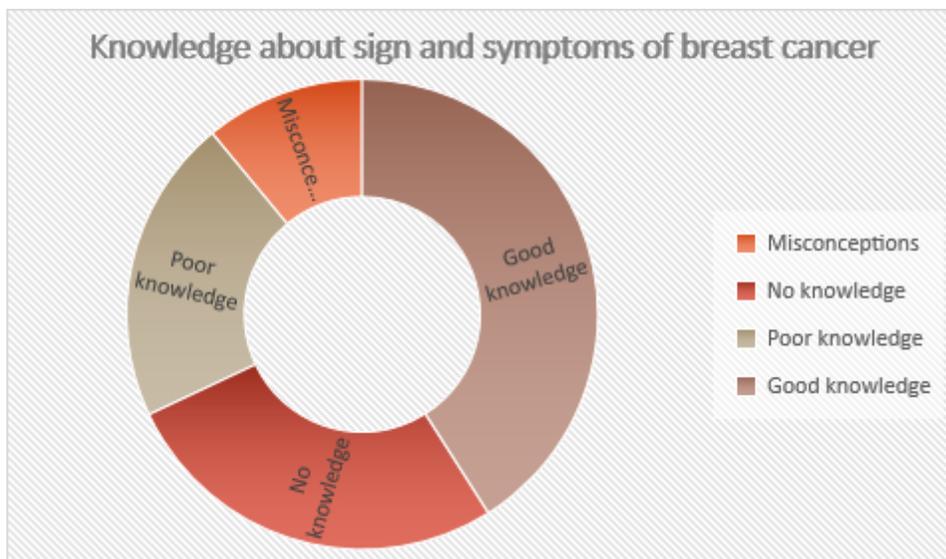
The figure showed the current knowledge about risk factors of breast cancer (conception after 30, increasing age, family history, obesity, use of contraception, life style etc). It was concluded that 184

out of 200 (92%) participants demonstrated good knowledge, 12 (6%) had poor knowledge, and 4 (2%) had no knowledge about knowledge of risk factors of breast cancer.

Table 3: Knowledge about sign and symptoms of breast cancer

Knowledge about sign and symptoms of breast cancer	Frequency	Percentage
Misconceptions	22	11
No knowledge	54	27
Poor knowledge	42	21
Good knowledge	82	41
Total	200	100

Figure 3: Knowledge about sign and symptoms of breast cancer



The third objective of this section was to assess current knowledge about sign and symptoms of breast cancer (lump, pain or discharge from nipple or under armpit, and change in breast size etc.) among women. 41%

participants had good knowledge, 21% had poor knowledge, 27% had no knowledge and 11% women had misconception about sign and symptoms of breast cancer.

Table 4: Knowledge about practices of women regarding breast self-examination

Knowledge about breast self-examination	Frequency	Percentage
Misconceptions	12	6
No knowledge	98	49
Poor knowledge	60	30
Good knowledge	30	15
Total	200	100

Figure 4: Knowledge about practices of women regarding breast self-examination



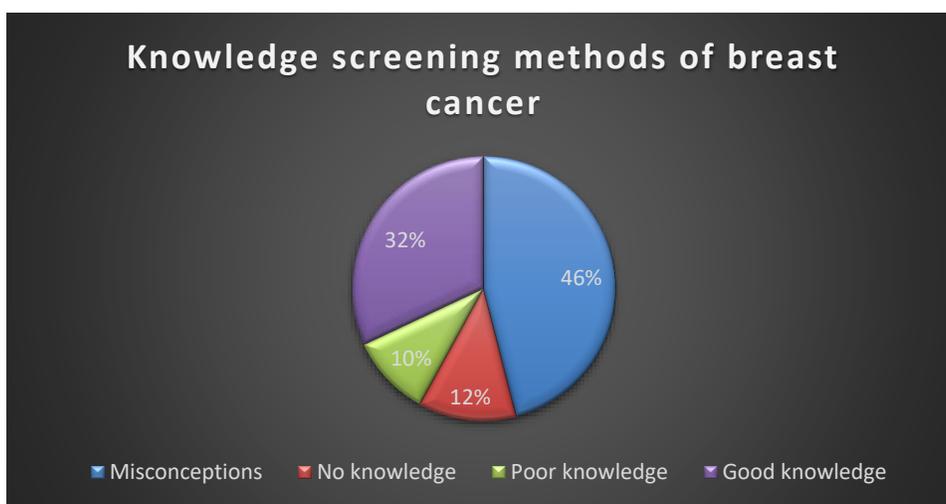
The fourth objective of this section was to assess current knowledge about practices of breast self-examination. According to preselected criteria of knowledge it was concluded that 30 out of 200 (15%)

participants demonstrated good knowledge, 60 (30%) had poor knowledge, and 98 (49%) had no knowledge and 12 (6%) had misconceptions about practices of breast self-examination.

Table 5: Knowledge about screening methods of breast cancer

Knowledge about screening methods of breast cancer	Frequency	Percentage
Misconceptions	92	46
No knowledge	24	12
Poor knowledge	20	10
Good knowledge	64	32
Total	200	100

Figure 5: Knowledge about screening methods of breast cancer



The results showed that current knowledge about screening methods such as breast mammography and clinical breast examination of breast cancer. 32% participants demonstrated good

knowledge, 10% had poor knowledge, 12% had no knowledge and 46% had misconceptions about screening methods of breast cancer.

IV. DISCUSSION

Pakistan is developing country and most of our population are living in rural areas. The total population of Pakistan is 200 813 816. Breast cancer is the most prevalent cancer in women in our country and the most common cause of death of all cancers. The number of new cases of breast cancer in 2018 was 34066 and accounts for 36% of all cancers in women. It was reported that 17158 deaths occur in females in 2018 due to breast cancer. Age-standardized-AS (World) incidence rates per 100,000 in females was 43.9 for breast cancer and AS mortality rate for breast cancer was 23.2 (The Global Cancer Observatory, 2019).

According to International Breast Cancer Foundation breast cancer is the most occurring cancer in women worldwide. An estimated 268,600 women has been diagnosed with breast cancer in U.S. Rarely men get breast cancer the ratio is 1 in 1000 in U.S. W.H.O has revealed that 2.1 million women were suffering from breast cancer worldwide and men rarely had breast cancer. Breast cancer is also common type of cancer in European countries. The incidence rate is 29.2% in females. Due to early screening and detection the survival rate is also good in these countries.

It has been found that the incidence rate of this disease has highest in Asian countries. A study conducted in Saudi Arabia showed that 90% cases of breast cancer were noted in 2018 in females. The rate is extremely high due to risk factors-gene mutations, obesity, nationality, dietary changes and some other factors.

Our study results also showed that breast cancer is common and prevailing in that area. Most of the women had good knowledge about the disease but only few females knew about breast-self examinations and screening of breast cancer. The study aimed to create awareness among females of that particular area. The focus of the study was to provide information among females about breast self-examinations.

V. CONCLUSION

Breast cancer is one of the leading causes of cancer in females in Pakistan and second leading cause of death worldwide. According to 2008 GLOBOCAN of WHO 1.38 million women suffer from the disease. It is estimated that 1 in 9 Pakistani women has breast cancer. It brings severe financial and social problems among families of Pakistan. Illiteracy is also a major cause because women have no proper awareness about personal hygiene. The study revealed that most of the females knew about the disease but their practices regarding breast self-examinations were poor.

VI. RECOMMENDATIONS

There is a need to create awareness about the breast cancer and motivate for monthly breast self-examination amongst community women of Taxila. Public awareness on breast cancer

and self-breast examination should be intensified using mass media and the health service personnel should promote this knowledge during their contact with female clients. Comprehensive curriculum regarding breast cancer should be incorporated at undergraduate and post-graduate courses of students in colleges as the incidence is increasing day by day. Exposure to health-related information and subsequently enhanced awareness not only improves health knowledge but also encourages healthy practices. Knowledge is a necessary predisposing factor for behavioural changes. Factors related to women's knowledge and beliefs about breast cancer and its management may contribute significantly to medical help-seeking behaviours. The study also emphasizes the importance of practical teaching and constant reminders through media led education campaigns, medical seminars, specific counselling and other methods. Health information provision or health education can bring about significant positive changes in health-related behaviours.

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The Correlation Of Immunohistochemistry Expression Anaplastic Lymphoma Kinase (ALK) With Level Of Stromal Tumor Infiltrating Lymphocytes (STILS) In Prostate Adenocarcinoma

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DOI: 10.29322/IJSRP.10.09.2020.p10584
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10584>

Abstract- Prostate cancer is currently the fifth leading cause of death in men. Now immunotherapy is used as a new paradigm of prostate treatment, where the therapeutic response is aimed at the role of Tumor Infiltrating Lymphocytes (TILs). Anaplastic Lymphoma Kinase (ALK) gene fusion has found in several types of malignancies has been clinically proven to demonstrate an effective therapeutic target response for patients with positive ALK. Currently, combination therapy continues to be developed, especially in cases of recurrence and metastasis, so it is necessary to research on prostate adenocarcinoma. The paraffin block of 32 prostate adenocarcinoma tissue was used to assess the level of stromal TILs and ALK immunohistochemistry. Results were analyzed using SPSS 22 version. ALK expressed in 87,5% of the prostate adenocarcinoma. There is no significant correlation between of ALK immunohistochemistry expression with the level of sTILs. but there is a tendency that grade group V shows a broad percentage of expression and strong intensity. Positive ALK expression in adenocarcinoma with high grade can be used as a prognosis and a optional treatment in prostate adenocarcinoma. The evaluation of the subset of TILs can be investigated further to assess its relationship to ALK expression. Index Terms- prostate adenocarcinoma, stromal TILs, anaplastic lymphoma kinase.

I. INTRODUCTION

Prostate cancer is one of the leading causes of impaired quality of men life in worldwide.¹ Now it is currently the second and fifth leading cause of cancer death in men. Based on GLOBOCAN 2018, an estimated 1.3 million new cases of prostate cancer, of which there are 359.000 deaths in worldwide. Cancer in men is most often diagnosed in 105 of 185 countries in the world, especially America, Northern and Western Europe, Australia / New Zealand, and most of Sub-Saharan Africa.² Indonesian Society of Urologic Oncology (ISUO) 2011 reported 971 prostate cancer patients in Indonesia from 2006 - 2010, where as many as 50.5% of the cases were prostate adenocarcinoma stage 4.^{3,4} Adam Malik Hospital, Medan in 2015-2016 reported 39 cases were diagnosed as prostate adenocarcinoma.⁵ Prostate adenocarcinoma is an invasive carcinoma consisting of neoplasms of prostate epithelial cells with differentiation of secretory cells. The histomorphological

form consists of glands, in the form of sheets of cells or single cells that experience neoplasia.⁶ Most prostate cancer occurs in the peripheral area, often without symptoms and usually new symptoms appear after reaching an advanced stage or metastasis.⁷

Tumor infiltrating lymphocytes (TILs) are the migration of lymphocytes into tumor or peritumoral cells.^{8,9} Many studies have reported the benefits of stromal TILs on tumor cells, where effective in inhibiting tumor progression, although the mechanism is still opposing. Histopathological measurement of stromal TILs is carried out to see the immune reaction against tumors, where can also affect the stage and grading of various types of cancer.¹⁰

ALK is an enzyme with tyrosine kinase activation, has pleiotrophin (PTN) and midkine (MDK) receptors, which secrete growth factors, known to bind and activate ALK downstream signaling.¹⁰⁻¹³ Several studies have shown that Nucleophosmin (NPM1-ALK) and Echinoderm Microtubule Associated Protein-like 4 (EML4-ALK) are found in Non-Small-Cell Lung Cancer (NSCLC), where treatment has shown a good response for patients with positive ALK.¹³⁻¹⁷

Recent preclinical data have also revealed that immune checkpoint proteins can induce ALK-positive NSCLC tumors, whereas currently combination checkpoint therapy (PD-1 / PD-L1, CTLA-4) and ALK inhibitors are being studied clinically in NSCLC patients with ALK positive.¹⁸ Based on the description above, the researcher is interested in assessing how "The Correlation Anaplastic Lymphoma Kinase (ALK) Immunohistochemical Expression and the degree of stromal Tumor Infiltrating Lymphocytes (sTILs) in Prostate Adenocarcinoma.

II. MATERIAL AND METHODS

Sample selection

This study was selected cross-sectionally, consist of 32 cases of prostate adenocarcinoma. The samples were obtained through TUR-P and core biopsy. Inclusion criteria are age from medical record, slides and paraffin were diagnosed prostate adenocarcinoma by histopathology.

Histopathological grading is a scale for determining the prognosis of a prostate adenocarcinoma based on histopathological assessment and the Gleason scale (WHO, 2016) which is categorized as:

1. Grade group 1, Gleason score ≤ 6 : consists of a combination of glands with well differentiation.
2. Grade group 2, Gleason score $3+4=7$: More well differentiation glands, followed by fusion and cribriform of glands.
3. Grade group 3, Gleason score $4+3=7$: More fusion/cribriform glands, followed well-differentiated glands.
4. Grade group 4, Gleason score $4+4=8$, $3+5=8$, $5+3=8$: Consists of both poorly differentiation and fusion gland patterns, well differentiation followed by poorly differentiation gland, or more poorly differentiation glands followed by well differentiation.
5. Grade group 5, Gleason score 9-10: poorly differentiation gland forms with or without necrosis or both poorly / solid differentiation.⁴

Stromal Tumor-Infiltrating Lymphocytes (sTILs) are defined as mononuclear inflammatory cells that are in the stromal tissue between the nests of cancer cells, and are not directly related to cancer cells. TILs are assess the percentage of stromal area alone without including calculations tumor cells at 400 magnification. The assessment is based on the focus of the most dense lymphocyte infiltration, divided by TILs working group 2013:

1. Mild : 0-10 % stromal TILs (HPFs 200-400x)
2. Moderate : 11-49 % stromal TILs (HPFs 200-400x)
3. Severe : ≥ 50 % stromal TILs (HPFs 200-400x).¹⁹

ALK expression was determined by assessing the clinical score determined based on the percentage of cells expressed on immunohistochemistry (scale 0 to 3) and staining intensity (scale 0 to 3), where the intensity of staining is given a value of 0 if not stained, 1 if stained weakly, 2 if moderate, 3 if strong. The percentage of cells expressed as 0 if $<10\%$, 1 if 11–40%, 2 if 41–70%, and 3 if $\geq 71\%$. The two scores are then added together with the result:

- 1 = Negative if the total score is 0-3.
2 = Positive if the total score is ≥ 4 .²⁰

Statistical analysis was performed using SPSS software version 22.0 (SPSS Inc., Chicago). To analyze data on Correlation of Anaplastic Lymphoma Kinase (ALK) Immunohistochemical Expression and the level of stromal Tumor Infiltrating Lymphocytes (sTILs) in Prostate Adenocarcinoma researchers used Mann-whitney U Test, p-value < 0.05 was considered significant.

III. RESULT

The youngest age distribution was 50 years old and the oldest was 82 years old with a mean age of 68.2. The largest age group was ≥ 71 years as many as 18 cases (56.3%). The most stromal level distribution of TILs was mild ($<10\%$) as many as 22 cases (68.7%). The distribution of the grade group in prostate adenocarcinoma, the highest was grade V as many as 14 cases (43.8%) and the smallest was grade 1 in 1 case (3.1%). The distribution of ALK immunohistochemical expression was the most positive expression in 28 cases (87.5%). Data from the

statistical test of this study showed $p = 0.050$, where the p value > 0.05 or there was no significant difference in the grade group.

Table 1. Correlation of ALK Expression and Grading Histopathology of Prostate Adenocarcinoma.

No	Grade group	ALK Expression				P-value*
		Negative		Positif		
		n	%	n	%	
1.	I	1	25,0	0	0	0,050
2.	II	1	25,0	3	10,7	
3.	III	0	0	5	17,9	
4.	IV	2	50,0	6	21,4	
5.	V	0	0	14	50,0	

* Mann-Whitney U test

The statistical test of Kruskal-Wallis was carried out to assess the correlation of level sTILs and the histopathological grade of prostate adenocarcinoma, it was obtained p-value = 0.718 ($p > 0.05$) which indicated no significant correlations.

Table 2. Correlation level of stromal TILs with Histopathological Grading of Prostate Adenocarcinoma.

No	Grade group	Level of sTILs						P- value*
		$<10\%$		10 – 49%		$\geq 50\%$		
		n	%	n	%	n	%	
1.	I	1	4,5	0	0	0	0	0,718
2.	II	2	9,1	2	25,0	0	0	
3.	III	4	18,2	1	12,5	0	0	
4.	IV	7	31,8	0	0	1	50,0	
5.	V	8	36,4	5	62,5	1	50,0	

* Kruskal-Wallis Test

The Mann-Whitney U statistical test to assess the correlation between the level of sTILs and the ALK expression obtained p-value = 0.758 ($p > 0.05$), which indicates no significant correlation.

Table 3. Correlation between Stromal TILs and ALK Expression

No	Level of sTILs	ALK expressions				P-value*
		Negative		Positif		
		n	%	n	%	
1.	$<10\%$	3	13,6	19	86,4	0,758
2.	10 – 49%	1	12,5	7	87,5	
3.	$\geq 50\%$	0	0	2	100	

* Mann-Whitney U Test

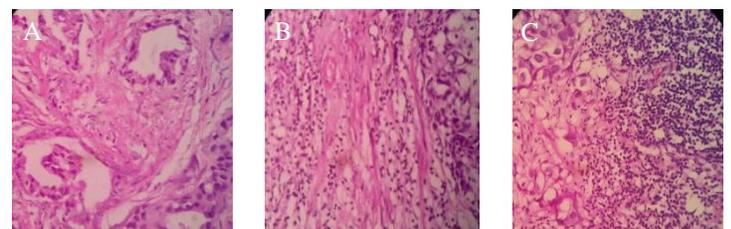


Figure 1. Infiltration of level stromal TILs of BPH. A. Mild 0-10%, B. Moderate 11-49%, C. Severe $> 50\%$.

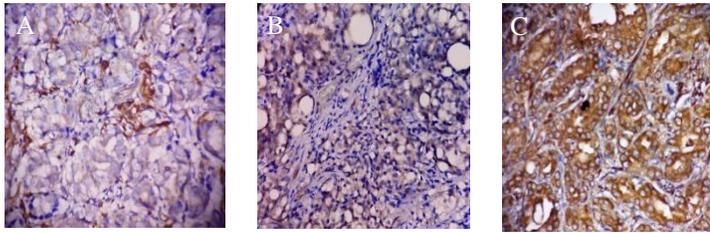


Figure 2. ALK Expressions, A. Weak, B. Medium, C. Strong

IV. DISCUSSION

Prostate Adenocarcinoma is the most common invasive carcinoma of the prostate epithelial cells. Clinical observations have proven that several factors, including androgens, heredity, environment, and somatic mutations have a role in the pathogenesis of prostate cancer.⁶ Most prostate cancers arise in the peripheral area, often without symptoms and usually new symptoms appear after reaching an advanced stage or metastasis.⁷ In this study the mean age for patients with prostate adenocarcinoma was 68.2 years. The data in this study are consistent with previous studies by Andreas MI et al., which found that nearly 90% of sufferers were over 60 years of age, of which two thirds of the deaths were over 75 years of age. The risk of prostate adenocarcinoma is closely related to age, where in men aged 70-79 years have an almost 7 times higher risk of developing prostate adenocarcinoma compared to men aged 50-59 years and have a 21 times higher risk of death.²¹ WHO also states that it is most detected at age > 60 years, of which only 1% detected on clinical examination were <50 years old. This is closely related to lifestyle and diet which are known to cause prostate cancer at a younger age. More and more evidence shows that glandular epithelial cell injury by carcinogens, estrogen or oxidants as a trigger for chronic inflammation is a step towards cancer cell development.²²

Gleason score is a strong predictor for determining the progression and prognosis of a prostate adenocarcinoma. However, recent studies are currently focused on the identification and validation of molecular markers that are very promising for prognosis in prostate cancer. Special attention to the gleason score and analysis of the development of cancer biology is very important in prostate cancer therapy. Furthermore, comparative oncogenomics with a valid function of a biological process have resulted in significant differences in prostate cancer patients in determining prognosis at first diagnosis or after undergoing surgery. This biological marker is still being developed with various trials to be more reliable in prostate cancer.²³ This study found 28 samples with positive ALK immunohistochemical expression and 4 samples with negative expression. Although there was no significant difference, from 28 samples found 14 samples (50%) with grade V group, where all samples expressed positive. This suggests a trend that ALK expression can be associated with grading of prostate adenocarcinoma

ALK is an enzyme that activates tyrosine kinase, by catalyzing the gamma phosphate group (derived from adenosine triphosphate) in to tyrosine residues on protein substrates.²⁴ ALK gene deviations in cancer are generally due to chromosomal rearrangements that produce gene fusion, which has the potential

to rapidly increase oncogenes. This situation has been proven by the presence of NPM1-ALK fusion and EML4-ALK fusion in Non-Small-Cell Lung Cancer (NSCLC). Increasing the number of point mutations that activate protein kinases will also activate oncogenes in ALK.¹⁴⁻¹⁶ Several tumor types are known to express the full length ALK Receptor Tyrosine Kinase (RTK). The protein receptors of the full length ALK RTK have been found on various tumor cells and tissues including neuroblastoma, neuroectodermal tumor, glioblastoma, and melanoma. Furthermore, full-length ALK cDNA derived from cloned RH30 rhabdomyosarcoma cDNA, which expresses full-length protein has also been reported to occur in rhabdomyosarcoma tumors. Initially ALK inhibitor immunoreactivity has been observed in several malignant tissue stains, such as breast carcinoma, malignant peripheral nerve sheath tumor, and lipogenic tumors, which exhibit more ALK fusion than full length receptors. It has been suggested that autocrine and / or paracrine growth figures involving PTN and MK can direct tumor growth expressing the normal full-length ALK receptor, and this mechanism has been investigated in glioblastoma, but has not been fully confirmed for other tumor types. Next Generation Sequencing (NGS) and ctDNA from a 39 year old small cell carcinoma prostate primary tumor have identified the ALK F1174C mutation. This analysis indicated that ALK amplification was associated with poor outcome.²⁵

Previously, there have been many studies showing that the tyrosine kinase receptor is a strong biomarker and a good therapeutic target for a large number of malignancies.^{26,27} The presence of ALK fusion and the ALK component tyrosine kinase activity has been used as a targeted therapy for several malignancies.²⁸ Initially ALK inhibitor used in NSCLC is crizotinib, whose potential small molecule has shown an overall response rate (ORR) of 65% compared with 20% docetaxel in patients who failed platinum-based therapy. Furthermore, crizotinib is associated with disease control in NSCLC patients with positive ALK fusion brain metastases.^{24,29,30} Various problems in prostate cancer suffers are the increased recurrence rate and the occurrence of metastases which results in an increasing rate of prostate cancer mortality. The results of this study indicate that ALK expression is very strong in grade V group or high grade so that it can be an alternative choice in the treatment of prostate adenocarcinoma.

Tumor infiltrating lymphocytes (TILs) is the migration of lymphocytes into tumor or peritumoral cells.^{31,32} Now, many types of prostate cancer have not known cause, but some literature reveals that genetic and environmental factors are considered to play a role. Some researchers suggest that inflammation can play a role in the formation of prostate cancer. This has been reported in the development of other cancers such as gastric, colon and liver.^{33,34} Tumor growth from the interaction between the tumor cell complex and microenvironment, including immunity cell infiltration, fibroblasts, endothelium, blood vessels, and it produces include cytokines, chemokines and their metabolites.^{35,36} Lymphocytes are known to be key mediators in adaptive immunity. In principle, lymphocytes are divided into T lymphocytes (cell mediate immunity) and B lymphocytes (humoral immunity). T lymphocytes secrete growth factor B lymphocytes, which stimulate differentiation and proliferation of B lymphocytes. B lymphocyte activation

produces plasma cells, secretes antibodies, lymphotoxins, and combines with NK cells to destroy malignant cells.^{31,36} T cells can be in the stromal and intraepithelial. The T cells in the stromal area CD4+ helper / inducer cells, while the intraepithelial cells are CD8+ cytotoxic / suppressor cells. CD4+ T cells are classified according to the cytokine profile into T helper (Th) -1 and T helper (Th) -2. Th1 expresses T-beta and interferon (IFN)- γ . Th2 expresses Gata-3 and IL-4. Other T cells selectively produce IL-17 and the transcription factor ROR γ t (Th17), and finally T cells are identified based on the production of Th9 and Th22 cell cytokines. Cytotoxic T cells are the lumen's first line of defense against foreign agents. Changes in the phenotype of helper T cells are important in determining which T cells develop in inflammation. The fact is that the immune response stimulates prostate cancer, as shown also from histological data which reveals the presence of CD4 + T cells, CD8 + T cells, Natural Killer (NK) cells, dendritic cells, and macrophages in tumors.³⁷⁻⁴⁰ There was no significant relationship between the level of sTILs and ALK expression and the association of sTILs with the grade of the prostate adenocarcinoma group, therefore further research is needed to assess the TILs subsets for prognosis and immunotherapy treatment in prostate adenocarcinoma.

V. CONCLUSION

There is a no correlation between the immunohistochemistry of ALK with level of stromal TILs in prostate adenocarcinoma

COMPETING INTERESTS

The author has no financial interests relevant to the product or company described in this article.

ACKNOWLEDGMENT

We would like to thank all staff of the Anatomical Pathology Department University of North Sumatra, Medan, Indonesia for all their assistance and cooperation.

ETHICAL APPROVAL

Health Research Ethical Committee, Universitas Sumatera Utara, Medan, Indonesia approved this study.

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Unsteady boundary layer of a Micropolar fluid flow past a moving wedge

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DOI: 10.29322/IJSRP.10.09.2020.p10585
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10585>

Abstract- We present an analytic and asymptotic solution of an unsteady laminar boundary layer of micropolar fluid flow past a moving wedge. Similarity transformations reduce the number of independent variables of partial differential equations in the governing system to a coupled system of ordinary differential equations. An exact solution obtained for particular values of parameters are extended to obtain an analytical solution for more general values of the parameters involved. Analytical results are consistent with the numerical results obtained by employing implicit finite difference method. The variations with position, material parameter and time, shown by Velocity, shear stress and gyration profiles obtained from both the solutions are analyzed.

Index Terms- Unsteady, Laminar boundary layer, Similarity transformations, Exact solution, Asymptotic solution

I. INTRODUCTION

Most of the fluid flows in real life are unsteady. Flow of water from compressor pump is a perfect example for an unsteady flow as the velocity changes with respect to time. Also it is not always possible to maintain steady state conditions in fluid flows. Thereby, it becomes important to shift our focus from steady to unsteady flows. Unsteadiness is an inevitable feature in many engineering machinery. Some of the unsteady fluid flows of practical interest are the helicopter rotor, the cascades of turbo, machinery blade, the ship propeller and so forth.

In the past few decades, many authors have been successful in finding numerical solutions of unsteady micropolar fluid flows with certain special boundary conditions using different mathematical approaches. Govardhan and Kishan[1] have investigated the MHD effects on the early unsteady boundary layer flow over a stretching sheet and solved using Adams Predictor-Corrector method of fourth order. Saleh et al[2] worked on unsteady micropolar fluid over a permeable curved stretching and shrinking surface and have solved numerically using shooting method. Nazar et al[3] worked on analysis of unsteady boundary layer flow and heat transfer of micropolar fluid flow over a stretching sheet and solved the system numerically using Keller box method. Lok et al [4] in their paper analyzed the growth of unsteady boundary layer flow of a Micropolar fluid which was started impulsively from rest near the forward[4] and also rear[5] stagnation point and solved numerically using Keller box method. Kumari and Nath[6] considered the flow, heat and mass transfer on the unsteady laminar layer in micropolar fluid flow at the stagnation point and have solved numerically using a quasilinear finite difference scheme. Many authors have employed a solution methodology based on the group theoretic method to reduce the number of independent variables of the partial differential equations of the governing equations and convert it into a system of ODE which is then solved by any of the DNS.

In this paper, we propose exact solution of an unsteady, laminar, incompressible, two dimensional boundary layer of micropolar fluid flow past a moving wedge. Exact solutions of the fluid flows are rare in fluid mechanics due to the complexity of the problem with an extra independent time variable even more so when immersed in micropolar fluid with microrotating microelements [23]. Also, nonlinear problems do not permit a superposition principle thereby ruling out the building up of complex solutions of simple ones. But exact solutions are important in their own right as solutions of particular problems but also more important in checking accuracy of numerical solutions. The exact method employed to obtain solution of two-dimensional, laminar, incompressible, unsteady boundary layer of micropolar fluid flow past a moving wedge is based on the derivation obtained by Kolomenskiy and Moffat [2012] which is similar to the derivation from the Lighthill's complex potential theory [8]

II. FORMULATION

An unsteady, two dimensional laminar boundary layer flow of an incompressible, viscous, micropolar fluid over a wall of a moving wedge with a constant velocity $U_w(x, t)$ is considered. x - axis is taken parallel to the wedge and y-axis is normal to it. Under usual boundary layer approximations [9] the governing equations for micropolar fluid flow past a wedge moving in the non-dimensional form with the absence of body forces and body couples, are

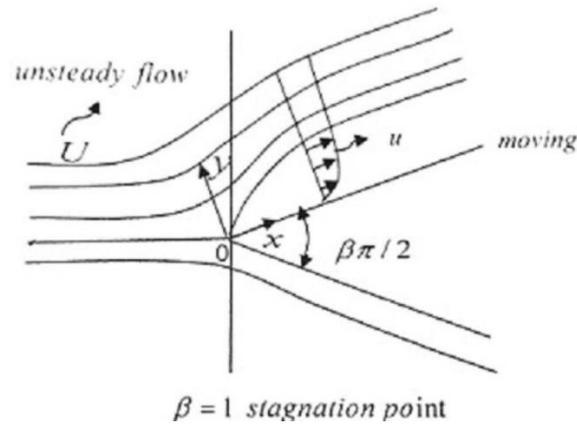


Figure1: Schematic diagram of boundary layer

Conservation of mass:
$$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} = 0 \tag{1}$$

Conservation of momentum:
$$\rho \left(\frac{\partial u}{\partial t} + u \frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} \right) = U \frac{dU}{dx} + (\mu + \chi) \frac{\partial^2 u}{\partial y^2} + \chi \frac{\partial \omega}{\partial y} \tag{2}$$

Conservation of angular momentum:
$$\rho j \left(\frac{\partial \omega}{\partial t} + u \frac{\partial \omega}{\partial x} + v \frac{\partial \omega}{\partial y} \right) = - \frac{\partial}{\partial y} \left(\nu \frac{\partial \omega}{\partial y} \right) - k \left(2\omega + \frac{\partial u}{\partial y} \right) \tag{3}$$

Conservation of micro-inertia:
$$\frac{\partial s}{\partial t} + u \frac{\partial s}{\partial x} + v \frac{\partial s}{\partial y} = 0 \tag{4}$$

where u and v are the velocity components in the x and y directions, ν is the kinematic viscosity of the fluid, $U(x, t)$ is the free stream velocity given by the power law $U(x, t) = U_\infty A(t)x^m$ [7] where x is the distance measured from the onset of the boundary layer, $A(t) > 0$, U_∞ , m are constants and $U_w(x, t)$ is the stretching surface velocity which obeys the power-law relation $U_w(x, t) = U_{0w} A(t)x^m$. Boundary conditions on velocity and microrotation are

$$\text{at } y=0, \quad u = U_w(x, 0), v=0, w = -\frac{1}{2} \frac{\partial u}{\partial y} \tag{5}$$

$$\text{as } \frac{y}{\delta} \rightarrow \infty, \quad u = U, v=0, w=0 \tag{6}$$

Introducing the stream function $\psi(x, y, t)$ with $u = \frac{\partial \psi}{\partial y}$ and $v = -\frac{\partial \psi}{\partial x}$ and adopting the co-ordinate transformations from the variables (x, y) to the new dimensionless similarity variables([10] [11] [12])

$$y = \left(\frac{2\gamma x}{(m+1)U} \right)^{\frac{1}{2}} \eta, \quad \psi = \left(\frac{2\gamma x U}{(m+1)} \right)^{\frac{1}{2}} f(\eta), \quad \omega = U \left(\frac{(m+1)U}{2\gamma x} \right)^{\frac{1}{2}} h(\eta), \quad s = \left(\frac{2\gamma x}{(m+1)U} \right)^{\frac{1}{2}} i,$$

$$\rho = \left(\mu + \frac{\chi}{2} \right) \left(\frac{2\gamma x}{(m+1)U} \right)^{\frac{1}{2}} i, \tag{7}$$

The boundary layer equations transform to the following non-linear ordinary differential equations

$$(1+k)f''' + ff'' + \frac{2m}{m+1}(1-f'^2) + kh' = D \left(\frac{\eta}{2} f'' + f' - 1 \right) \tag{8}$$

$$\left(1 + \frac{k}{2}\right)(ih')' + i \left(fh' - \frac{(3m-1)}{(m+1)} hf' \right) - k(2h + f'') + Dhi = 0 \tag{9}$$

$$Di - (1-m)if' + \frac{(m+1)}{2} fi' = 0 \tag{10}$$

where
$$D = \left(\frac{2U_\infty^{m-2} A'(t)}{(m+1)\gamma^{m-1} A^2(t)} \right)^{\frac{1}{2}} .$$

The boundary conditions are

$$f(0)=0, \quad f'(0)=-\lambda, \quad i(0)=0, \quad h(0)=-\frac{1}{2} f''(0) \tag{11}$$

$$f'(\infty) \rightarrow 1, \quad h(\infty) \rightarrow 0$$

where η is a new similarity variable, $f(\eta)$ is the non-dimensional stream- function and $\lambda (= -\frac{U_{0w}}{U_\infty})$ is

the ratio of free stream velocity and boundary value $\lambda < 0$ corresponds to wedge moving in the direction of stream

velocity whereas and $\lambda > 0$ corresponds to that of opposite direction. $k = \frac{\chi}{\mu}$ where $\mu = \rho\gamma$ is the

dimensionless viscosity ratio[22]. the stream wise pressure gradient is favorable pressure gradient when $m > 0$ and adverse pressure gradient when $m < 0$ whereas Blasius flow over a flat plate when $m = 0$ [12]. The flow corresponding to stagnation point when $m = 1$ [8].

III ANALYTICAL SOLUTION

When $D = 0$, the solution of micro inertia density equation (10) satisfying boundary conditions (11) is

$$i = A f^{\frac{2(m-1)}{(m+1)}} \tag{12}$$

where $A = C^{\frac{2}{(m+1)}}$ is a non- dimensional constant of integration. Using the boundary condition $i(0) = 0$ leads to $i(\eta) = 0$ which is a trivial solution, in which case (9) reduces to

$$h = -\frac{1}{2} f'' \tag{13}$$

substituting (12) and (13) in (8) we get

$$\left(1 + \frac{k}{2}\right) f''' + ff'' + \frac{2m}{m+1} (1 - f'^2) = 0 \tag{14}$$

In this paper, we obtain the solution analytically, asymptotically and numerically of this equation with the boundary conditions

$$f(0) = 0, \quad f'(0) = -\lambda, \quad f'(\infty) \rightarrow 1 \tag{15}$$

where primes denote differentiation with respect to η . We seek exact solution [16] of (14) with (15). Exact Solution of (13) for $m = -1/3$ [17] is obtained by integrating (14) twice and applying the boundary conditions (15) which results in a Riccati type equation and leads to the solution of (14) as

$$f = \eta + \delta - \frac{\delta e^{-\left(1+\frac{k}{2}\right)^{-1}\left(\frac{\eta^2}{2} + \delta\eta\right)}}{1 - \frac{\delta\left(1+\frac{k}{2}\right)^{-\frac{1}{2}}}{2} e^{\frac{\delta^2}{2\left(1+\frac{k}{2}\right)}} \sqrt{\frac{\pi}{2}} \left[\operatorname{erf}\left(\frac{\left(1+\frac{k}{2}\right)^{-\frac{1}{2}}(\eta + \delta)}{\sqrt{2}}\right) - \operatorname{erf}\left(\frac{\left(1+\frac{k}{2}\right)^{-\frac{1}{2}}(\delta)}{\sqrt{2}}\right) \right]} \tag{16}$$

Provided $\delta^2 = -\frac{2(1+\lambda)}{\left(1+\frac{k}{2}\right)}$. To obtain an exact analytical solution of the system (13) with (14) for

different values of m and k , we rewrite the solution (15) as

$$f(\eta) = \eta + \delta - \frac{\delta}{G(\eta)} \tag{17}$$

where

$$G(\eta) = e^{\frac{\delta^2\left(1+\frac{k}{2}\right)}{2}} - \frac{\delta\left(1+\frac{k}{2}\right)^{-\frac{1}{2}}}{2} e^{\frac{\delta^2}{2\left(1+\frac{k}{2}\right)}} \sqrt{\frac{\pi}{2}} \left[\operatorname{erf}\left(\frac{\left(1+\frac{k}{2}\right)^{-\frac{1}{2}}(\eta + \delta)}{\sqrt{2}}\right) - \operatorname{erf}\left(\frac{\left(1+\frac{k}{2}\right)^{-\frac{1}{2}}(\delta)}{\sqrt{2}}\right) \right] e^{\left(1+\frac{k}{2}\right)^{-1}\left(\frac{\eta + \delta}{2}\right)^2} \tag{18}$$

For any m and D eqn (7) When $i(0)=0$ and $h = -\frac{1}{2} f''$ is

$$\left(1 + \frac{k}{2}\right) f''' + ff'' + \frac{2m}{m+1} (1 - f'^2) = D \left(\frac{\eta}{2} f'' + f' - 1 \right) \tag{19}$$

$$f(0) = 0, \quad f'(0) = -\lambda, \quad f'(\infty) \rightarrow 1 \tag{20}$$

Substituting (17) into (19) and (20), we get

$$\left(1 + \frac{k}{2}\right) \left(G^2 G''' - 6GG'G'' + 6G'^3\right) + \left(\eta + \delta - \frac{D\eta}{2}\right) G^2 G'' - 2(\eta + \delta - D)GG'^2 - \left(\frac{4m}{m+1} + D\right) G^2 G' + \delta \left(2 - \frac{2m}{m+1}\right) G'^2 - \delta GG'' = 0 \tag{21}$$

with the boundary conditions

$$G(0) = 1, G'(0) = \frac{\delta}{2}, G'(\infty) = 0. \tag{22}$$

The solution of (21) for $m = \frac{-1}{3}$, subject to (22) is given by (16). The error and exponential functions in equation (18) are entire functions with infinite radius of convergence about $\eta = 0$ and therefore can be expanded using Taylor series.

Further the solution (17) which is in series representation [20] for $m = \frac{-1}{3}$, plays an important role in further analysis for general values of m . Thus we let

$$G(\eta) = \sum_{n=0}^{\infty} a_n \eta^n \tag{23}$$

for general m and k . Substituting (23) into (21) and equating the coefficients of η^n to zero we get the coefficients a_n and in general

$$\begin{aligned} a_{n+3} = & \frac{-1}{\left(1 + \frac{k}{2}\right)(n+1)(n+2)(n+3)} \left(-\left(1 + \frac{k}{2}\right) \delta \sum_{i=1}^n (i+1)(i+2) a_{n-i} a_{i+2} + \left(\frac{-2}{m+1}\right) (n-i+1) a_{n-i+1} a_{i+1} \right) \\ & + \sum_{j=0}^{n-1} \left(\sum_{i=0}^{n-j} \left(1 + \frac{k}{2}\right) (j+3)((j+2)(j+1) a_{n-j-i} a_i a_{j+3} + \sum_{i=0}^{n-1-j} \left(1 - \frac{D}{2}\right) (j+1)(j+2) a_i a_{j+2} - 2(i+1) a_{i+1} a_{j+1}) a_{n-j-i-1} \right) \\ & + \sum_{j=0}^n \sum_{i=0}^{n-j} (j+1) \left(-6 \left(1 + \frac{k}{2}\right) (j+2)(i+1) a_{n-j-i} a_{i+1} a_{j+2} + 6 \left(1 + \frac{k}{2}\right) (i+1)(n-j-i+1) a_{n-j-i+1} a_{i+1} a_{j+1} \right. \\ & \left. + \left(1 + \frac{k}{2}\right) \delta (j+2) a_{n-j-i} a_i a_{j+2} - \left(1 + \frac{k}{2}\right) (2\delta + D) (i+1) a_{n-j-i} a_{i+1} a_{j+1} - \left(\frac{4m}{m+1} + D\right) a_{n-j-i} a_i a_{j+1} \right) \end{aligned} \tag{24}$$

where $n = 1, 2, 3, \dots$ and the coefficients a_n have been expressed in terms of a_2, δ, k, m . The value of coefficient of skin friction a_2 that satisfies the derivative boundary condition at far away from the wall has to be determined. This is same as determining the value of either a_2 of series (20) or $f''(0)$ of the system (14) and (15) as they are intrinsically related to each other by the following

$$a_2 = \frac{2f''(0) + \left(1 + \frac{k}{2}\right)\delta^2}{4\left(1 + \frac{k}{2}\right)\delta} \tag{25}$$

The coefficients a_n consists of two arbitrary constants, namely $f''(0)$ and δ . For $m = \frac{-1}{3}$, we match the series (23) with the exact solution (16) which gives $\delta = \frac{-4(1+\lambda)}{2+k}$. This constant δ plays an important role in this analysis. The solution of (14) exists only when the expression under the square root in δ , is positive. The other constant or a_2 needs to be determined. Thus, (14 - 15) have infinite solutions in the form of (23). The constant $f''(0)$ is determined in the following manner. We integrate (14) from $\eta=0$ or $\eta=\infty$ and use (15) to get

$$\int_0^\infty \left(\frac{\left(1 - \frac{D}{2}\right)f' - f'^2 + \frac{2m}{m+1}(1 - f'^2)}{1 + \frac{k}{2}} \right) d\eta + \frac{D}{2}\eta_\infty = f''(0) \tag{26}$$

Since skin friction $f''(0)$ appears on both sides of (25) and (26) it has to be determined iteratively using an appropriate initial approximations for it, taken from the known exact solution(16), (20) and (26) for all values of k , m and λ . $f''(0)$ converges when the derivative condition at far distance in (14) is satisfied (Kudenatti et al 2013). It is known that the series behaves well for small values of η enabling its integration. So Pade's approximants are used for the summation of the series. With an initial approximation of $f''(0)$ and a fewer iterations, $f''(0)$ can be obtained up to desired accuracy without any difficulty by numerically integrating the integral relation. Thus we obtain an exact solution of the equation for all the values of m , D and k . To prove the robustness of the method the values of skin friction $f''(0)$ obtained analytically are compared with that of direct numerical solution of the equation (14) with boundary condition (15) obtained using Keller Box method(Cebeci[14]) ,based on finite difference. It is observed that results agree well with the Numerical solution for all the values of parameters

IV ASYMPTOTIC SOLUTION

We analyze the far-field behavior of (19) with boundary condition (20) asymptotically for which we study large η behavior i.e $f'(\eta) = 1$ as $\eta \rightarrow \infty$ because the derivative boundary condition $f'(\eta)$ becomes linear as η increases away from zero. This helps us to define a new function

$$f(\eta) : \eta + E(\eta) \tag{27}$$

where $E(\eta)$ and their derivatives are assumed to be small. Substituting (23) with $f'(\eta) = 1 + E'(\eta) = 1 + F(\eta)$, $f''(\eta) = E''(\eta) = 1 + F'(\eta)$ and $f'''(\eta) = E'''(\eta) = 1 + F''(\eta)$

into (19) with the boundary conditions (20) and linearizing the resulting ordinary differential equation, we get

$$\left(1 + \frac{k}{2}\right)F''(\eta) + \left(1 - \frac{D}{2}\right)F'(\eta) - \frac{4m + D}{m + 1}F(\eta) = 0 \tag{28}$$

and boundary conditions take the form

$$F(0) = -(1 + \lambda), \quad F(\infty) = 0 \tag{29}$$

whose solution eventually results in, Kummer's equation [27] with solution involving confluent hypergeometric series [26]. Thus the solution to (28) is given by

$$F(\eta) = (1 + \lambda) \left[-M \left(\frac{\frac{4m}{m+1} + D}{D-2}, \frac{1}{2}, \frac{-(2-D)}{4\left(1 + \frac{k}{2}\right)} \eta^2 \right) + \sqrt{\frac{2-D}{\left(1 + \frac{k}{2}\right)}} \frac{\Gamma \left(1 - \frac{\frac{4m}{m+1} + D}{D-2} \right)}{\Gamma \left(\frac{1}{2} - \frac{\frac{4m}{m+1} + D}{D-2} \right)} \eta M \left(\frac{\frac{4m}{m+1} + D}{D-2}, \frac{3}{2}, \frac{2-D}{4\left(1 + \frac{k}{2}\right)} \eta^2 \right) \right] \tag{30}$$

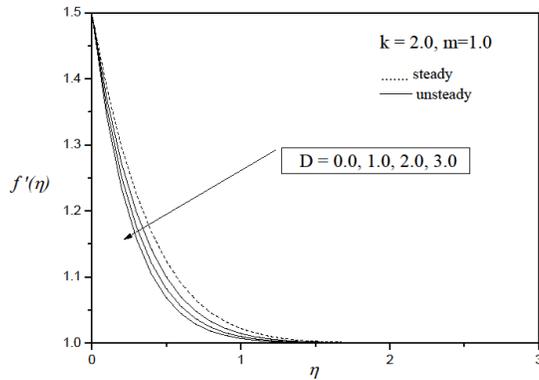
The solution in terms of $f(\eta)$ is given by $f'(\eta) = 1 + E'(\eta) = 1 + F(\eta)$

V RESULTS AND DISCUSSION

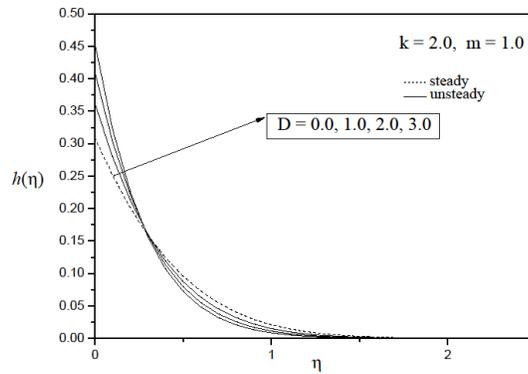
Exact solution of unsteady boundary layer of a micropolar fluid flow past a moving wedge is obtained by using error and exponential function for particular values of pressure gradient m and unsteady parameter D and is then extended using series solution to more general values of m, D . To substantiate the method of exact solution, the analytical results of skin friction are compared with those obtained by DNS (Keller box method) and presented in table 1. Analysis of velocity profiles helps to know the significance of the method employed and the physical nature of the unsteady micropolar flow in the boundary layer. Also, interesting physical dynamics of the model over the range of parameters is shown in the profiles.

Table 1: Comparison of the skin friction $f''(0)$ obtained by analytical method and numerical method.

λ	K = 0.0		K = 1.0		K = 2.0	
	Exact	Numerical	Exact	Numerical	Exact	Numerical
-1.1	-0.2000956	-0.201269	-0.161143	-0.162525	-0.137365	-0.139835
-1.2	-0.405645	-0.406175	-0.326743	-0.328015	-0.281375	-0.282235
-1.3	-0.613243	-0.614666	-0.494653	-0.4964291	-0.425126	-0.427165
-1.4	-0.824321	-0.826697	-0.665643	-0.667726	-0.5727634	-0.574589
-1.5	-1.040943	-1.042217	-0.840876	-0.841868	-0.722734	-0.724476



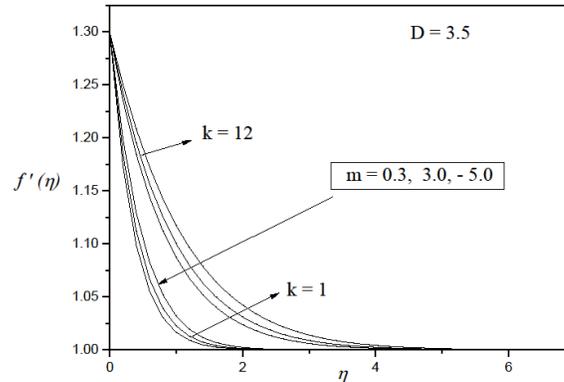
(2)



(3)

Figure : Variation of velocity profiles $f'(\eta)$ and $h(\eta)$ with η for different values of unsteady parameter D .

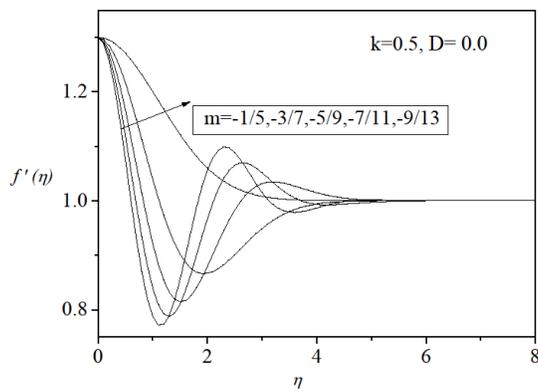
In figure 2, the velocity curves decrease monotonically to achieve the derivative boundary condition at infinity. When $D = 0$ velocity curve represents the steady flow model which is shown in dashed line in the figure. It is also observed that as unsteady parameter D increases the velocity of the fluid is found to be increasing which results into an increase in the Reynolds number, and thus, the boundary layer thickness is thinner. Since, for positive D , flow is considered to be accelerated, it is expected that the velocity is essentially increases. It is anticipated that, though the large D asymptotics is not performed here, for increasing D the flow turns out to be steady for which wall shear stress is almost constant. In figure 3, we also see the gyration profile $h(\eta)$ plotted against non-dimensional co-ordinate in which angular velocity decreases satisfying the boundary condition far away from the wedge wall. As D increases the angular velocity increases when closer to the wall but decreases with increase of D at a certain distance from the wall.



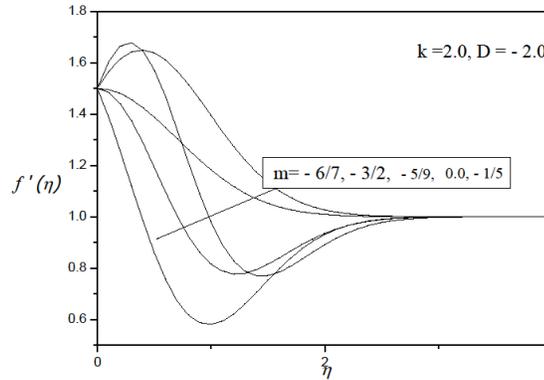
(4)

Figure : Variation of velocity profiles $f'(\eta)$ with η for different values of pressure gradient m for $k=1$ and $k=12$ when unsteady parameter is 3.5 is taken

In figure 4, as the pressure gradient increases the increases and the boundary layer thickness decreases. for a value of material parameter $k = 1$. The same pattern is observed for $k=12$. However the velocity decreases with increase of the material parameter showing increase in the boundary layer thickness.



(5)



(6)

Figure : Asymptotic velocity profiles $f'(\eta)$ with η for different values of m when $D=0$ and $D=-2.0$

Figure 5 presents the asymptotic results obtained from (30) when values of pressure gradient m are held negative this corresponds to the adverse pressure gradient. As interesting velocity profiles are noticed in the unsteady boundary layer which are rather new. There are finite number of oscillations in the boundary layer for example $m = -1/5$ there are four modes in the velocity curve before decaying onto the mainstream, This corresponds to undershoots (i.e., $f'(\eta) < 1$ for some η) in the boundary layer . Oskam and Veldman (1982) have also noticed the similar oscillatory-type boundary layer profiles for negative pressure gradient. The same typical trend is observed for all negative values of m .

We intentionally plotted the velocity profiles for other set of m and D in figure 6. It is noticed that the same typical nature occurs quite often. Since k and D are different, we observe that there are less number of oscillations compared to the results of figure 5.

Table 2: Comparison of the skin friction $f''(0)$ obtained by asymptotic method with Numerical method.

λ	K = 0.0		K = 1.0		K = 2.0	
	Asymptotic	numerical	Asymptotic	numerical	Asymptotic	numerical
-1.1	-0.364038	-0.277144	-0.210177	-0.157831	-0.171609	-0.128443
-1.2	-0.728076	-0.561549	-0.420355	-0.319899	-0.343218	-0.260352
-1.3	-1.09211	-0.853064	-0.630532	-0.486115	-0.514827	-0.395656
-1.4	-1.45615	-1.151545	-0.840709	-0.656395	-0.686436	-0.534284
-1.5	-1.82019	-1.456854	-1.05089	-0.830662	-0.858045	-0.676173

Table 2 shows the comparison of the asymptotic values of skin friction with the numerical values. We see that the values agree closely with each other though asymptotic results are obtained at far distance. Hence, there is a slight variation in the skin-friction but however the corresponding velocity profiles satisfy the derivative conditions.

In figure 7, it is observed that wedge velocity for increasing λ is greater than the main stream velocity .Therefore different velocity nature is observed for different λ .For $\lambda = -1.0$, there is no boundary layer formation and hence coincides with wedge wall.

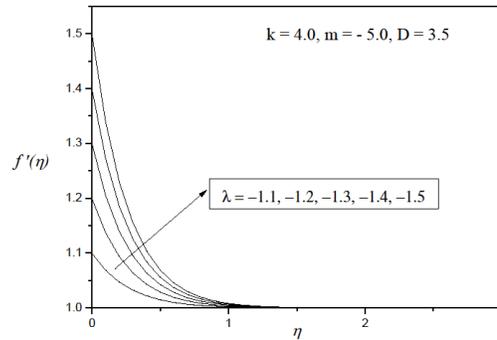


Figure: Asymptotic velocity profiles $f'(\eta)$ with η for different values of

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The Effect of Tax Incentive on Domestic Investment in Ethiopia: ARDL Approach

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DOI: 10.29322/IJSRP.10.09.2020.p10586
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10586>

Abstract- The aim of this paper was to evaluate the effect of tax incentive for domestic investment from 1982 to 2017 using quantitative method, descriptive design and secondary data. The ARDL (Autoregressive distribution lag) approach with ordinary least squares (OLS) for co integration and error correction model was employed to investigate the long-run and the short-run relationship between the dependent variable and the explanatory variables. There was a positive significant effect of tax incentive on domestic investment in the long run; that is a one percent change in tax incentive brought about 1.401 percent changes in domestic investment at five percent significance level. The finding implied that domestic investment has been stimulated through tax incentives complemented with sustainable economic growth, basic infrastructures, and social overheads, improved and globally inclusive market. Finally the whole system is getting adjusted at the speed of 74.15% towards the long-run equilibrium. The study basically recommended that the government of Ethiopia should approve implementation of critical and periodically cost- benefit effective tax incentive with good access of market, basic infrastructure and sustainable economy to boost domestic investment.

Index Terms- Tax Incentive, Domestic Investment, Ethiopia, ARDL

I. INTRODUCTION

Both developed and developing countries offer tax incentive to promote investment, however, the effect of tax incentive on investment is still a subject matter of considerable debate in economic theory and policy (UN, 2018 and Thabani, 2014). Scholars debate about the set of policies needed to promote investment for developing countries (Atukeren, 2005). Both developed and developing countries are trying to attract investment through various fiscal and non-fiscal incentives. Tax incentive is among fiscal incentives used by many countries to attract investors and increase investment in a country (Easson and Zolt, 2002). Tax revenues are necessary as a veritable tool of economic growth and development depends on a proper tax system which has the capacity to generate revenue through tax. While fulfilling the revenue function, taxes also have a pervasive influence on economic decisions of individuals and businesses, and on social equity (SADC, 2004).

Developing countries use tax incentives to promote investment, but it is ineffective and unclear to what extent they attract investment (Klemm, 2010). According to Proclamation

No. 769/2012, the country Ethiopia offers different tax incentives to encourage investment, increase inflow capital, speed up the transfer of technology, promote the equitable distribution of investments, transparency and efficiency of administration and benefit the society.

II. STATEMENT OF THE PROBLEM AND LITERATURE REVIEW

Majeed (2008) argued that countries with a high participation of investment succeeded in higher economic growth and made many economic and structural reformations to encourage as well as attract potential investment. Investment incentives mostly focus on economic performance objectives as a policy instrument for attracting investment, despite persistent criticism that they are economically inefficient and lead to misallocations of public funds (Blomstrom, 2003).

The implication of high investment levels is the productive capacity of the economy which in turn, subsequently leads to higher rates of economic growth, job creation and opportunities for the poor to improve their livelihoods (Esubalew, 2014). The tax incentive system plays an important role in the life of the society and development of the country; however the mere existence of tax incentives doesn't guarantee the effective growth of an economy and proper mobilization. There appear two perspectives regarding the effectiveness of fiscal incentives, some argue that fiscal incentives promote investment which generates job opportunities and leads to overall economic growth. On the other hand, those who advise against tax incentives argues tax preferences create inequity, abusive tax and avoidance schemes which may erode the revenue base (Bolnick, 2004).

Despite the aforementioned debate, Ethiopia has undertaken tax reforms, introduces incentives and made amendment the policies of the past governments in power such as deregulation, privatization and liberalization of the foreign exchange market. The government has reduced customs import duties, exemptions from payment of export customs duties and income tax holding (Proclamation No. 769/2012). However, there is no document which assessed the effect as a result of these tax incentives on domestic investment.

According to Esubalew (2014) proportion of domestic investment in Ethiopia was 11.9 percent of GDP. On the other hand, as per Ethiopian Revenue and Customs Authority(ERCA) annual report shows that revenue forgone granted to investment was 51.07% of government revenue in 2014 and it's also growth remains steady that indicates huge amount loss of public resource not to finance the needs of society (ERCA, 2014).

The paradox between low investment and huge forgone revenue needs further research to be conducted in the sector.

Designing appropriate strategies for catalyzing and stimulating investment in Africa requires a good understanding of the key determinants or drivers of investment in African countries (UNCTAD, 2014). To encourage domestic investment and attract different programs, tax incentive which is most popular has been introduced, but fails to assess its cost-benefit and its effectiveness remain debatable in developing countries. There is little empirical analysis in the academic arena on determinants of domestic investment but fail to look the nexus between foreign direct investment and domestic investments; which used a panel data to examine the determinants of domestic investment for some African countries but ignores the link between domestic investment foreign direct investments (Haile, 2013).

Even Esubalew (2014) investigated determinants of domestic investment in East Africa, including Ethiopia using panel data and that analyzed the relationship domestic investment with foreign direct investment and public investment, but failed to see the effect of tax incentive; and regression analyzed by Abdishu (2013) and Kurabachew (2016) have failed too who have seen only the effect of tax incentive on domestic investment in manufacturing sector and did not examine the relationship among domestic investment, public and foreign direct investment.

Therefore; the researcher has attempted on conducting a research on the effect of tax incentive on domestic investment Ethiopia from 1982-2017 which includes the determinants of domestic investment using ARDL approach of co integration to fulfill the above stated gaps.

III. METHODOLOGY

The research approach used for this study was quantitative research which has been performed by using both descriptive research design and econometric analyses. Quantitative research uses a standard format with a few minor, interdisciplinary differences of generating a hypothesis to be proved or disproved. The researcher entirely relies on secondary data types which are annually time series covering from 1982-2017 regarding variables domestic investment as dependent variable and trade openness, inflation, investment, infrastructure, lending interest rate, growth rate of gross domestic product (GDP) and foreign direct investment (FDI) as explanatory variables.

An econometric method of data analysis was used to determine the significance level of selected explanatory variables which determine the investment decision in Ethiopia. The empirical investigation has been carried out using auto regressive distributed lag (ARDL) model of ordinary least squares (OLS) estimation techniques by using Eviews 9 as a data analysis package technique.

Augmented Dickey Fuller test, bound test and other relevant tests have been conducted to examine unit root test and the relation between dependent variable domestic investment and explanatory variables. Econometrics can be used to test the compatibility of a theory, to measure unknown values of theoretically defined parameters or unobservable variables, to predict the value of a variable and characterize a relationship or phenomena (Hoover, 2006).

Model Specification

The study follows the leads of the flexible accelerator theory of investment due to lack of adequate data of macroeconomic variables that enables to estimate investment function (Oshikoya, 1994) and (Ghura and Goodwin, 2000). According to Ayeni (2014) the accelerator theory because the variables of the accelerator theory, such as GDP growth, FDI (as percentage of GDP), inflation (annual percentage changes) and interest rates can be accessed adequately in comparison to other macroeconomic economic variables that affect investment. The most commonly used model in examining the determinants of private investment in least developing countries is the flexible accelerator model. Hence, like previous studies such as Bakar (2011), and Mutenyo *et al.* (2010) and Thabani (2014), this study used a modified flexible accelerator model specifically with availability of data. The model used in the study can specify in the following which also had been used John (2012) general form with modification:

$DI = \beta_0 + \beta_i X_i$ then also modified to include focus variable

$$DI = \beta_0 + \beta_i X_i + \beta \text{INCENTIVE}_i + \varepsilon \quad (3.1)$$

Where; $DI = \text{Domestic Investment}$

This function specifies Domestic investment as a function of the priority variable (incentives) and other control variables (X). The model is modified to take special features of the country and theories into account. DI is the dependent variable measures domestic investment which is defined in real value. Given the difficulty of measuring tax incentives, this study used a dummy variable to show the presence and absence of tax incentives in sectors under consideration. It is assumed that: Tax incentive takes a value of 1 if the incentives are offered and zero otherwise. Vector X_i represents other variables which affect the flow of DI . These control variables are Market growth/size (real GDP growth rate), FDI, Openness of the economy, public investment and macroeconomic instability such as inflation, real interest rate. Though many variables have been proposed by literatures as determinants of DI it is not possible to include all of them. Due to this fact, we chose few of them depending on previous studies specific to a country, the strength of the variety and availability of data. ε is an error term and β_0 is an intercept of system equations. The estimated model is:

$$DI = f(\text{GDPGR}, \text{INF}, \text{FDI}, \text{MOP}, \text{PUB}, \text{LR}, \text{DUMT}) \quad (3.2)$$

Where, DI -operational domestic investment inflow in real value based on 2000 constant price

FDI -operational foreign direct investment based on 2000 constant price

$GDPGR$ real gross domestic product growth rate

INF -Inflation based on consumer price index $OPEN$ -Market/Trade openness ($\text{Imp} + \text{Expo} / \text{GDP}$) LER - lending interest rate in annual %

PUB - Public Investment based on 2000 constant price $DUMT$ = Dummy variable for tax incentives.

By introducing the „ u “ is called error term or random disturbance term or stochastic term, the extended model is:

$$DI_t = (\beta_0 + \beta_1 GDPGR_t + \beta_2 INF_t + \beta_3 OPEN_t + \beta_4 LER_t + \beta_5 FDI_t + \beta_6 PUB_t + \beta_7 DUMT_t + u_t) \dots\dots\dots(3.3)$$

β_0 is an intercept of the model (constant term); $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ and β_7 are estimate coefficients of GDPGR, INF, OPEN, LER, FDI, PUB, and DUMT respectively. All the Variables are converted into a logarithm form before estimation to reduce

problems of heteroscedasticity and percentages (elasticities) approaches.

$$LGDI_t = (\beta_0 + \beta_1 LGDPGR_t + \beta_2 LGINF_t + \beta_3 LGOPEN_t + \beta_4 LGPUB_t + \beta_5 LGFDI_t + \beta_6 LGLER_t + \beta_7 LGDUMT_t + u_t) \dots\dots\dots(3.4)$$

with zero mean and constant variance to keep the data set consistent, over the 36 years spanning from 1982 to 2017.

Table 3.1: Tests of time series data

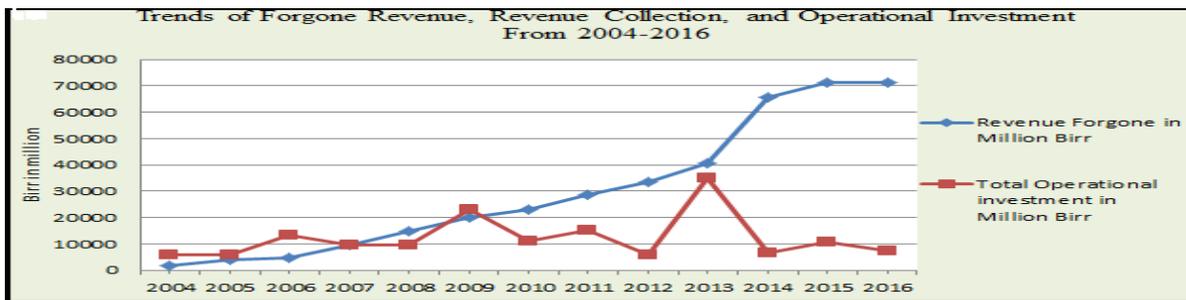
Diagnostic Test	Type of Test	Null Hypothesis	Category	Test
Stationarity	ADF unit root Test	There is unit root		Pre-estim.
Co integration	Bound Test	No Co integration		Pre-estim.
Normality	Jarque-Bera	Normally distributed		Post-estim.
Serial Correlation	Breush –Godfrey LM	No Serial Correlation		Post-estim.
Heteroscedasticity	Breush–Pagan-Godfrey	No Heteroscedasticity		Post-estim.
Model specification	Ramsey RESET Test	Model specified well		Post-estim.
Model stability	CUSUM	Test		-----

Source: (Gujarati, 2004).

The test of multicollinearity left out because it is soundless test in lagged same variable of time series data. The cumulative sum of recursive residuals (CUSUM) was applied to test structural breakpoint which have recommended by Pesaran and Shin (1999, 2001).

IV. RESULT AND DISCUSSION

Figure 4.1: Trends of Forgone Revenue and Operational Investment over 2004-2016



Source: EIC, ERCA, 2017

In the long run, holding other things constant, a one percent change in foreign direct investment (FDI) brought a 0.96971 percent decrease in domestic investment. This finding implies that FDI has a crowding out effect (displaces) on domestic investment which is not desirable for the development of Ethiopia. In fact, the common belief is that FDI complements domestic investment because foreign firms are associated with better technology that may spill over to domestic investment. Generally, developing countries experience negative spillover effect while developed countries experience positive spillover effect; and many developing countries experience negative spillovers from FDI because of the wider technological gap that exists between foreign firms and the domestic firms (Mutenyu *et al.* 2010).

The variable GDP growth proxy of measure of market size/growth is significant with p-value 0.0463 at the 5 % level of significance and coefficient is 0.173090 with an expected positive sign, thus, lending credence to the principle effect. Growth rate real output promotes investment because it indicates

changes in aggregate demand for output that investors seek to meet. The findings confirm to some previous studies. Frimpong and Marbuah (2010), Esubalew (2014) among other studies. So, in the long run, keeping other things constant, a one percent change in gross domestic product brought a 0.173090 percent increase in operational domestic investment. It also creates consistent with expectations of neoclassical investment theory, positive association between investment and income growth.

In this study, inflation has found insignificant at 5%, but significant, with 10% and with an expected negative sign. At 10%, this has found to be significant and was confirmed by Kassahun, (2010) represented by its current, inflation is estimated to have a negative influence on the growth of investment that a 1 percent increase in the rate of inflation inflicts the growth of domestic investment decreased by 0.310944 percent. And this finding confirmed with neo-classical (Keynesian) theory in which rise in interest rate increases cost capital goods that constrained investment which in turn leads to a lower rate of investment. Thus,

in the long run, the lending interest rate has an adverse effect, but insignificant on domestic private investment. This has confirmed to the finding of Esubalew (2014) in East Africa adverse effect of interest rate on domestic private investment due to its underdevelopment and financial repression.

Trade openness has a positive sign and significant relationship with domestic investment. The probability value of t-statistics for openness is 0.0062 which is below both 5 and 1 percent level of significance. The coefficient of market openness which is measured as a log of the ratio of import-export with real GDP is positive and statistically significant at both 1% and 5% means the more open the market system is the higher the Domestic investment holding other factors constant. The positive sign is as per our expectation and it is due to the open market policy of the Ethiopian government, which creates trade opportunities for the domestic investors. This result is the same as Guadagno (2012) and Kassahun (2010); the higher the import-export rates of a country the greater the market opportunity or trade openness for investors.

Tax incentives have been used by governments as tools to promote a particular economic goal. Investment tax incentives are used both to encourage capital accumulation in the long run and to stimulate economic activity in the short run. In case of this study the dummy variable for investment (and change tax) policy, particularly tax incentive policy, which is the main focus of the study, turns out to great improvement in investment with a

coefficient 1.4009 and p-value 0.0183 which is significant with a positive coefficient. This can be due to tax policy change from Dereg to EPRDF helped grow on average by 1.401% per year in domestic private investment at 5% level significance. This result is consistent with Van Parys and Klemm (2011), James (2009) and UN (2018). The positive sign here agrees with the assumption that the lower tax rate means lower cost burden and higher profit after tax for investors. Regardless, only those tax incentive programs that can pass cost-benefit assessments of both economic and revenue impacts are worth attempting or preserving.

In general, GDP growth, trade openness, public investment and tax incentive dummy have a positive and significant, whereas FDI is negative and significant while LER and Inflation are negative but insignificant determinants of domestic operational investment in the long run. And the strength of variables' effect on domestic investment market openness has a strong positive effect while tax incentive has a strong positive significant effect next to trade openness, however, FDI and LER have negative with proportional strong effect on domestic effect on domestic investment. This confirms with the result of Tanzi (2000) and Zee, (2002) in which tax incentives can promote investment, but they are not the "first best" solution as overall economic and institutional environment may be more important for a success of projects. Finally, the estimated **long-run model** presented as follows with figures in the parenthesis indicates the p-value.

$$\begin{aligned}
 \text{LGDI} = & 10.73 - 0.012T - 0.97\text{LGFDI} + 0.173\text{LGGDP} - 0.311\text{LGINF} - 0.99\text{LGLEN} + \\
 & \quad (0.005) \quad (0.1946) \quad (0.0463) \quad (0.0967) \quad (0.138) \\
 & 2.16\text{LGOP} + 0.17\text{LG P U B} + 1.40\text{D U M T} \quad (0.002) \quad (0.00) \quad (0.02)
 \end{aligned}$$

Table 4.2: Estimated Long-run Coefficients Using ARDL Approach

Dependent Variable: LGDI				
Selected Model: ARDL(2, 3, 3, 3, 3, 2, 3, 3) Based on AIC				
Regressors	Coefficient	Std. Error	t-Statistic	Prob.
LGFDI	-0.969371	0.068655	-14.119418	0.0050*
LGGDP	0.173090	0.029782	5.811899	0.0463**
LGINF	-0.310944	0.104444	-2.977141	0.0967
LGLEN	-0.988476	0.411369	-2.402895	0.1382
LGOPEN	2.159902	0.170199	12.690434	0.0062*
LG P U B	0.169182	0.010532	16.063716	0.0039*
Tax incentive DUMT	1.400954	0.192010	7.296266	0.0183**
C	10.724456	0.441229	24.305894	0.0017*
@TREND	-0.012085	0.006289	-1.921626	0.1946
R-squa. 0.998408	Adjusted R-squ 0.974531	F-stat 41.81501	Prob . 0.023613	

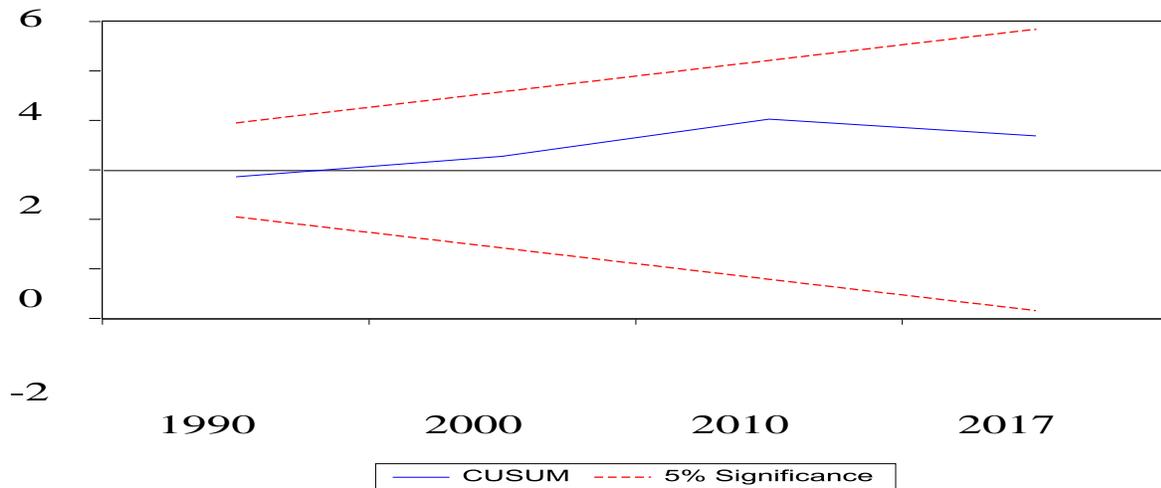
Source: Author's calculation, 2018 Using Eviews 9

Note: **, * indicates five and one percent level of significance

The model stability test using cumulative sum of recursive residuals (CUSUM) could be replaced for Chow test structural breakpoint. If the plot of CUSUM statistic moves between the critical bounds/red lines (at 5 percent significance level), then the estimated coefficients or the model/system are/is said to be stable

in the long run. Figure 4.3 reported that the plot of CUSUM test did not cross the lower and upper red lines critical limits which indicated that, the estimate is stable and there is no any structural break in the long run.

Fig 4.3. The Plot of the Cumulative Sum of Recursive Residuals



Source: Computed by the Author, 2018 using Eviews 9

V. CONCLUSION

Investment has been recognized as a facilitator of economic growth for developing countries as a result, the government of Ethiopian has introduced investment incentives (tax incentives) since 1982 to promote domestic investment and attract FDI. The study on trend of investment and tax incentive indicates that an inconsistent relationship between investment and tax incentive in which their trend shows neither similar, nor regular pattern. This merely indicates the existence of other powerful investment determining factor. Thus, the provision of the tax incentive scheme to attract investment was not the only factor that boosts investment rather other non-tax determinants are more effective in persuading investors in favor of making more participation in the economy. In the study period, tax incentives and government revenue not balanced and revenue generation has remained ineffective due to tax-base erosion effect.

Based on the empirical analysis of long-run ARDL model, it can be concluded that the hypothesis is consistent with the theory and tax incentive was found to be determining factor which confirms with the intention of governments towards fiscal policies. Though providing duty and tax incentives in the short run has a negative impact on revenue, productivity, in the long run it has a positive impact on increasing domestic investment thereby revenue productivity as well as sustainable economic growth. Based on the long run ARDL model output, a one percent change in tax incentive, leads 1.401 percent change in domestic investment, given that other remains constant.

Further, other determinant factors of domestic investment are, GDP growth, trade openness and public investment have a

positive and significant, whereas FDI is negatively significant. On the other hand, FDI has to crowd out effect on domestic investment which indicates that the existence of a very wide technological gap compared to that of the developed countries, making it difficult for domestic firms to realize the technology transfer in the form of spillover effects, and the sustainability of any country's economic development hinges on the growth of local entrepreneurs. Finally the whole system is getting adjusted at the speed of 74.15% towards the long-run equilibrium.

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Adoption Determinants of Improved Cook Stove among Rural Households: The case of Benishngul Gumuz Reginal State, Ethiopia

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DOI: 10.29322/IJSRP.10.09.2020.p10587

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10587>

Abstract- Energy consumption of rural households' depends on traditional energy sources including wood, crop residue, coal, and animal dung, which inefficient and largely attributed to air pollution and deforestation problems. To this end adoption of improved cook stove has anticipated to reduce these problems. So, the prime objective of the study was to investigate the determinants of improved cook stove adoption in Case of Assosa District, Benishngul Gumuz Reginal State, Ethiopia in the year 2018. The study was conducted based on descriptive design and mixed method research on a target population of 3880 households from Assosa district with sample size of 341 households that determined using Kothari formula based on proportional sampling technique from each selected sub districts and 20 key informants selected using purposive sampling technique. Binary logit regression model was employed for econometrics analysis using STATA software. The finding showed that stove design and neighborhood effect are the most determinants of improved cook stove adoption. Hence, for fast dissemination; cook stove design should not be one fit for all policy rather cooks stove design should take into account the socio-cultural feeding practice of the potential adopters.

Index Terms- Adoption, improved cook stove, Binary logit regression.

I. INTRODUCTION

The open fires and primitive stoves have been used for cooking since the beginning of human history with various sizes and styles and have been modified based on cultures, food preparation approaches and stove models (Sameer and World Bank, 2011). In developing countries about 3 billion people's energy sources depend on traditional fuel including wood, charcoal, coal, leave, crop residues and animal dung with traditional and inefficient stove technology to meet household cooking and heating needs (World Bank, 2011).

In many countries women are responsible for the collection, transportation, processing and storing of fuel, as well as the cooking activities; burdens associated with traditional biomass cooking are disproportionately felt by women because of their customary involvement in cooking, women's exposure is much higher than Men's (World Bank, 2011 and Grace, 2014).

These open fire and traditional cook stove emit substantial amount of smoke which affects human health, high deforestation, negative impact of climate change and losses production opportunity (Puzzolo *et al.*, 2013). According World Health Organization (2017), estimated that about 1.5 million per year premature deaths are associated with the indoor air pollution in 2030, which more deaths than malaria. Ethiopia's energy supply is heavily depending on traditional solid fuel energy both in rural and urban areas that account about 95% (World Vision, 2016 and Zenahbezu, 2017).

The government and concerned stakeholders have not give enough attention to the status of adopting improved cook stove. Improved cook stove is a device designed to improve combustion efficiency of biomass, consume less fuel, save cooking time, convenient in cooking practice and creates smokeless environment in the kitchen and reduce the volume of smoke against the traditional stove (Damte and Koch, 2011).

II. PROBLEM STATEMENT AND LITERATURE REVIEW

Ethiopia is one of the least developed countries, with the lowest per capita energy consumption and dominated by traditional sources of energy (Mebratu, 2017). About 95% of the total national energy consumption is derived from traditional biomass fuel; only 5% is derived from commercial energy mainly petroleum fuels and electricity (Woldu, 2015).

The extensive poverty in developing countries needs appropriate energy service provision to pull out of poverty which is vital input for socio economic growth, mainly for industries, commerce, agriculture, and social services. The first attempt to improve traditional solid biomass stoves was made in India in the 1950s which have been designed with a chimney to remove smoke from the kitchen (Hammond, 2007 and World Bank, 2011). In 1970s researchers was focused on the technical aspects biomass stoves like thermodynamic and heat transfer but the adoption of stoves still remain at marginal level (Puzzolo *et al.*, 2013; and Gifford, 2010).

These traditional cook stoves have very low energy efficiency, most of the potential energy 85% or more is wasted comparing to improved cooking stoves and mostly causes of indoor and outdoor pollutions (Zenebe, 2007). The nature and concept of improved cook are designed to improve energy efficiency and remove smoke from the indoor living space (Hude,

2014 and Menasbo, 2016). Improved cook stove optimized heat transfer, reduced fuel consumption, reducing health impacts and deforestation that reduce climate impacts (Smith *et al.*, 2014). The strategy of the Ethiopian government is to reduce the demand on wood fuel, conserve the forest and militate against increase greenhouse gaze effect, and reduces indoor air pollution by introducing improved wood stove. But the current penetration level of improved efficient wood stove for the rural households is still below 23%, that is the adoption of the technology has been slow, unevenly distributed among households and unaware about the technology (Shanko, 2009).

According (Anthony and Chikamso, 2017), even the access to energy is gradually improving to reach 20% by the efforts of the government, but lower than the Sub-Saharan Africa average 26%. As a result, the efficient energy supply coverage in the rural areas still remains low because of limited progress in modern energy supply activities. This major problem leads to biomass which covers 80-95% Ethiopia’s primary energy demand by inefficient way (Heimann, 2007; warkaw, 2015).

Unfortunately, studies about the determinant factors of improved cook stove adoption are limited in Ethiopia, studies by Gebreeziabher (*et al.*, 2012) and Warkaw (2011) both in Tigray, Tigabu (2014) in Amhara and Amogne (2014) in Oromia; were based on what factors determine household demand for cook stove energy which are household characteristics, household income, stove price, having separate kitchen, access to open forest and social and institutional influence. But the determinants of improved cook stoves adoption and sustained use have not yet fully examined and the supply side factors such as access to credit, suitable stove design, production site decentralization and early adopter neighbors are not include in identifying determinant factors of rural household improved cook stove adoption decision in previous studies.

Improved biomass energy technologies have the potential to reduce the negative impacts of traditional biomass energy use (Beyene and Koch, 2013). Improved cook stoves are designed to reduce heat loss, decrease indoor air pollution, increase combustion efficiency and heat transfer (Masera *et al.*, 2000).

Additionally, most of the previous studies also conducted on highland areas of Ethiopia in which where the feeding culture of the highlanders are different from the lowlands; the former familiar with ‘injera’ baking but the later (the study area) familiar with the unique mode of baking porridge (Genfo baking) which consumes more fire wood and time open fire and inefficient way of cooking than ‘injera’ baking which leads high environmental, health and agricultural productivity effects. Therefore; the researcher concerned about the determinant factors of improved cook stove adoption of the households in the district as a result to fill the above gaps.

III. METHODOLOGY

It articulates and presents all essential methods which are helpful to meet the desired objectives of the study in efficient and effective manners. The unit of analysis of this study was the efficient cook stove adopters and non-adopter households in rural Assosa district from selected twelve sub districts. Both secondary and primary methods of data collection as well as cross sectional data type were employed over the selected rural households. And

as a primary data sources interview, questionnaire and physical observation and as a secondary data sources document review were conducted.

Both probability and non - probability sampling technique procedures were used to select the survey areas and sampling unit of households selected and interviewees. The district was classified in cluster based on the geographical and cultural characteristics of the community in to sub districts in order to select proportionally through random lottery method. Similarly purposive sampling technique was employed to select key informant interviewees.

Sample Size Determination: Using Kothari (2004: pp. 179) sample size determination formula $n = \frac{z^2 pq}{e^2}$ with 95% level of confidence interval a total of n= 349 households were selected randomly from the selected 12 sub districts of the study area out of the N= 3880. Each sub district has a sample size proportional to its population.

With the objective of reducing uncertainty, incomplete answers and other fictitious responses the STATA and SPSS software respectively were employed for data analysis. the data. Data collected through semi-structured interviews were analyzed by the use of intensive textual analysis as well as both descriptive and econometrics analyses were used.

Dependent variable: cook stove adoption (csa) was given value ‘1’ if the household adopters while ‘0’ assigned to non-adopters. To assess the status of cook stove adoption by rural households, respondents were asked whether they purchase cook stove in the form of yes or no questions. Independent variable: The independent variables are selects based on the existing theories and empirical studies.

Table 3.1 Operational Definition of variables with expected sign

Variables	Operational Definition	Expected
Age (age):	it is a continuous variable measured in years	In determine
Marital status (marsta)	is a dummy which refers to single(1) or married (0)	Negative (-)
Education level hh head (litle)	is a dummy which refers to literate(1) or illiterate(0).	Positive (+)
Familysize (famsize):	is a discrete variable, the number of family size live in the same hh.	In determine
Separate kitchen (sepakich)	is a dummy has separate kitchen(1) or for has not (0).	In determine (+/-)

Source of wood (sowood)	is a dummy that get wood without charge (1) or with charge (0).	Negative (-)
Price (price)	is a continues that refers to the end users cost to buy cook stove.	
Distance from stove production center (discenter)	is a dummy that refers hh near (1) or far (1)to production center.	Negative (-)
Stove Design (stodes)	Stove design is a dummy refers to whether the stove is suitable or not. A value of '1' will be assigned for comfortable design '0' for others.	Positive (+)
Early adopter neighbors (eanghbo)	A dummy variable refers to early adopt HHs value 1 for early adopters 0 otherwise	Positive (+)
Extension worker	A dummy variable value 1 for exist 0 otherwise	Positive (+)
Household Income (Gender)	A continuous variable measured in ETH. birr A dummy that reflects households head 1 female 0 other wise	Positive (+) Negative (-)

Source: own completion (2018)

Model Specification

The research was used logit regression model, the rural households would decide to adopt improved stove or use traditional cook stove.

$$Y_i = \begin{cases} 1 & \text{if household adopts improved stove} \\ 0 & \text{otherwise} \end{cases}$$

Here the dependent variable is dichotomous, taking 0 or 1 values, there is a need of a probability model that has these two features (1) as X_i increases, $P_i = E(Y = 1 | X_i)$ increases but never steps outside the [0, 1] interval, and (2) the relationship between P_i and X_i is non-linear thus, one can easily use cumulative distribution function (Gujarati, 2004). Both Logistic and probit regression models satisfy the above two conditions. But, even though there is no base statistical theory for preferring one over the other, there are two practical advantages of the logit model than probit model The first one is its simplicity: second its interpretability the inverse linearizing transformation for the logit model is directly interpretable as log-odds, while the inverse transformation for probit does not have a direct interpretation. By taking in to consideration these advantages, the researcher preferred to use binary logistic regression model to predict the effects of independents variables on the dependent variable.

Therefore, the dependent variable is dichotomous, i.e. to adopt or not to adopt: thus, the dependent variable $Y_i = 1$ if the household adopt the stove, and $Y_i = 0$ if the household do not adopt. To adopt or not to adopt in relation to independent variables can be depicted in linear probability as follow: $Y_i = \beta_0 + X_i\beta +$

$\epsilon_i \dots \dots \dots (1)$ This is the usual linear regression model, the drawback of this model is ϵ_i only two values: If $Y_i = 1$ then $\epsilon_i = 1 - X_i\beta$ (with prob. P_i , If $Y_i = 0$ then $\epsilon_i = - X_i\beta$ (with prob. $1 - P_i$) Here, ϵ_i is not normally distributed but rather has a discrete (binary) probability distribution. Therefore, the expectation mean of ϵ_i conditional on the exogenous variables X_i from the above. $E(\epsilon_i/X_i) = (1 - X_i\beta)P_i + (-X_i\beta)(1 - P_i) = E(\epsilon_i/X_i) = P_i - X_i\beta$ Setting this mean to zero as in the classical regression analysis mean: $E(\epsilon_i/X_i) = 0, P_i X_i\beta \dots \dots \dots (2)$ The probability of an event is always a number between 0 and 1(inclusive), so: $P_i = (prob. 1/X_i) = X_i\beta \dots \dots \dots (3)$ Therefore, ϵ_i follow the binary distribution, i.e (ϵ_i is binary distribution) leads to rise logit model. The logistic distribution

function is: $prob. (\epsilon_i < X_i\beta) = \Lambda(X_i\beta) = \frac{e^{X_i\beta}}{1 + e^{X_i\beta}} \dots (**)$. Here the response probability prob. ($Y_i = 1$) is evaluated as: $P_i = prob. (Y_i = 1/X_i) = prob. (\epsilon_i > -X_i\beta/X_i = 1 - prob. (\epsilon_i < -X_i\beta/X_i) = 1 - \Lambda(-X_i\beta) = 1 - \frac{e^{-X_i\beta}}{1 + e^{-X_i\beta}}$

$P_i = \frac{e^{X_i\beta}}{1 + e^{X_i\beta}} \dots \dots \dots (4)$, Similarly, the non- response probability is evaluated as: $1 - P_i = prob (Y_i = 0/X_i) = 1 - \frac{e^{X_i\beta}}{1 + e^{X_i\beta}} = 1 - P_i = \frac{1}{1 + e^{X_i\beta}} \dots \dots \dots (5)$

Note that the response and non- response probabilities both lie in the interval [0, 1] and hence, are interpretable. Therefore, for the logit model, the ratio is given by: $\frac{P_i}{1 - P_i} =$

$$\frac{prob.(Y_i=1/X_i) \frac{e^{X_i\beta}}{1 + e^{X_i\beta}}}{prob.(Y_i=0/X_i) \frac{1}{1 + e^{X_i\beta}}} = \frac{P_i}{1 - P_i} = e^{X_i\beta} \dots \dots \dots (6)$$

$P_i / (1 - P_i)$ are the odds ratio in support of adopting the stove i.e. the household will adopt the stove to the probability that it will not adopt the stove. Taking the natural logarithm of equation (6) which can obtain.

$$\ln\left[\frac{P_i}{1 - P_i}\right] = X_i\beta = \beta_0 + X_1\beta_1 + X_2\beta_2 \dots + X_k\beta_k \dots (7)$$

Here the log of odds ratio is linear both in X_i and in the parameters. Therefore, (β_0) stands for intercepts. While X_i is the hypothesized determinants of stove adoption and β_k are the parameters to be estimated. Therefore, the model employed has the following form, with the error tem:

$$\ln\left(\frac{p_i}{1 - p_i}\right) = \beta_0 + \beta_1age + \beta_2gender + \beta_3marsta + \beta_4famsize + \beta_5litlev + \beta_6sepk + \beta_7sowood + \beta_8price + \beta_9houincom + \beta_{10}discen + \beta_{11}stodesin + \epsilon_i$$

Where, X_i - independent variables, β_0 - constant, β_i - regration coefficients of the independent variable (slope)

Diagnostic Tests

Any analysis should incorporate thorough examination of logistic regression diagnostics before reaching a final decision on model adequacy (Hosmer –Lemshew 2000). Model-Fit test is one of the most useful tests for truly assessing model fit for binary logistic regression models (Gujarati, 2004). The test shows the overall goodness of the fitted model is indicated by insignificant chi- square (p- value > 0.05) the model produce a significant difference between the observed and predicted probability so, the

predicted model is fitted since the prob> chi2 was found to be 0.239 which is greater than 0.05.

The multi-collinearity is a problem when the correlation result is above 0.80 and below -0.80 (Stock and Watson, 2007). The coefficients of all variables were found to be within the specified range and hence there is no issue of multi-collinearity as it ranges from (-0.5951 to 0.7074). In addition, Variance Inflation Factor (VIF) was tested with a result of 1.80. According to Wooldridge (2002), by rule of thumb, VIF value of 10.00 is used as a critical point to indicate serious multi-collinearity problem. Therefore, there was no severe multi-collinearity problem since 1.80 is less than 10.00.

From the total of 341 respondents 211 (62.2 %) were found non-adopters of improved cook stove while 130 respondents (37.8%) are adopters. This indicates that majority of the households were found to be non-adopters. Based on the data collected through appropriate instruments the most important reason for low adoption rate of improved coke stoves in the study area are poor institutional organization, low community awareness among others. The stove under dissemination is poor in quality the designs are poorly related to the feeding habits of the population in the study area. The major limitations of the current improved stoves under dissemination in the study area are bulky/difficult to transport, easily cracking and heat external part are the main problems that hinder the demand of the stove respectively. So, the existing cook stove has technical problem that hinder the technology adoption by itself and they suggests the stove under

distribution requires re-design to solve the existing poor quality of the stove under dissemination and the biomass sources of energy took households' energy consumption which is covered 95.4%, followed by electric and solar energies that for light only 3.4% and 1.2% respectively.

With regard to cooking activities porridge (locally genfo) and injera baking preparation was found to be the largest energy consumption practice for 204 (59.8%) and 131 (34.4%) respondents respectively and followed by water heating 6(1.8%). From the above analysis it can be understand that for most households wood is the main sources of energy for cooking and baking porridge as well as the food preparation responsibility was 100% over done by women's, With regard to fuel-wood supply for the household consumption were done by women, girl children but almost men and child boys do not have contribution for food preparation and wood collection. The distribution of improved cook stove is gonziye 13.7%), lackech 5.2% and mirt 0% with total of 18.9%.

IV. RESULTS/FINDINGS

The below Table 4.1 presents results of the logistic regression model where the first column (1) depicts the likelihood (probabilities) of adopting improved cook stove in the study area. Column (2) of the same table displays the odds ratio.

Table: 4.1: Logit regression result (Maximum Likelihood Estimation Result)

VARIABLES	(1) Coefficients (dummy for adoption)	(2) Odds ratio (Odds ratio)
Age of household head (in years)	-0.0379 (0.049)	0.963 (0.039)
Household head is female (1=yes)	-1.111* (0.591)	0.329* (0.237)
Household head is married (1=yes)	-1.248 (0.943)	0.287 (0.342)
Household Size	0.0796 (0.167)	1.082 (0.164)
Household head literate (1=yes)	1.366*** (0.501)	3.920*** (2.103)
Household has separate kitchen (1=yes)	-0.278 (0.398)	0.757 (0.331)
Household has access free wood (1=yes)	-0.629 (0.516)	0.532 (0.289)
Log of household income	1.523*** (0.447)	4.585*** (1.588)
Log of improved cook stove price	0.580 (0.957)	1.786 (1.881)
Good stove design (1=yes)	2.609*** (0.631)	13.580*** (8.287)

Log distance improved cook stove production.	-0.851*** (0.231)	0.427*** (0.108)
Household has early adopters neighbor (1=yes)	1.302* (0.667)	3.677* (2.676)
Household access extension services (1=yes)	0.0730 (0.545)	1.076 (0.582)
Constant	-11.15* (5.628)	0.000* (0.000)
Observations	341	341

Standard errors *** p<0.01, **p<0.05, * p<0.1(Gujarati, 2004)

Gender is significant factor at 10% level of significance with p-value 0.06 and odd ratio 0.329, the likelihood adopting improved cook stove is about 67.1% (= 1- 0.329) higher for female household heads as compared male.

Literacy level significantly affects the probability of improved cook stove that literate household head are 3.920 times more likely adopt improved cook stove as compared illiterate household keeping all other covariant constant.

House hold income was found positive significant determinant factor implies that as household income increase by one birr the probability of improved cook stove adoption increase by 4.585 percent keeping other covariates constant. The distance from home to improved cook stove production center has a negative effect implies that as distance from stove production center increase by one kilometer, the probability of improved cook stove adoption decrease (1- 0.427= 0.573) by 57.3 percent keeping other covariate constant. As it was expected stove design was a positive significant factor. All key informants, sub district leaders and development workers are strongly agree that government collaboration with partner to change the present infant stage energy consumption and improved stove adoption are the best mitigation mechanism for the household health and environmental protection.

V. CONCLUSION

The finding reveals that majority of households energy consumption, depends on fire wood followed by crop residual leafs and coal which cover 80.7%, 17.8%, and 1.5% respectively while kerosene, solar and electricity are lowest energy consumption in rural district for the purpose of light which may aggravate, deforestation and lose of soil fertility which in turn environmental degradation, human health problem and farm land productivity reduction.

Improvement in resource-use efficiency through technological alternatives like biogas, wind power, solar energy and improved stove technology is vital however; still application of technological alternative energy of the district is in infant stage. The economic, social, environmental and health benefits from

these stoves have always outweighed the costs of the stoves. Furthermore, survey result shows that only 38.1 per cent of the households adopt improved cook stove and they become more advantageous in terms of high improvement in speed of baking, reduce biomass collection time and reduce smoke as compared to non-adopters.

Among the improved cook stove adoption factors, gender of the household head is found to be negative and significant to affect adoption *i.e.* female headed households are more likely to adopt energy saving cook stove compared to male headed households. Regarding education only 26.8 percent of literate households found to be not engage on improved cook stove adoption, while 73.2 percent of the literate households adopt improved cook stove, this difference is highly significant which implies that literate household heads have more likelihood to access modern improved cook stove than the illiterate households in the district.

Adoption of improve cook stove is positively and significantly affected by economic status and positively related to neighborhood effect that is improved stove adopter households have 71.9 percent early adopter neighbors while non-adopter households 28.1 percent as well as a stove design which fits the cultural food preparation practice of a community is found to be an important and significant factor for adoption.

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Intrarater And Interrater Reliability Of Timed Functional Arm And Shoulder Test In Patients With Shoulder Joint Pathology-A Cross-Sectional Study

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DOI: 10.29322/IJSRP.10.09.2020.p10588

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10588>

Abstract- Shoulder pain is common in general population with various pathologies. Since most of patients have their dominant arm as affected arm, activities of daily living are grossly affected. There are various scales and test used for measuring functionality level of patients. However most of these scales are self reported measures. The Timed functional arm and shoulder test (TFAST) is quick, easy and feasible in measuring different constructs of functional performance that are normally involved in upper extremity impairments. **Aim of the study:** The aim of study was to evaluate inter-rater reliability and intra-rater reliability of Timed Functional Arm and Shoulder Test (TFAST) in patients with shoulder joint pathology. **Study design:** Cross-sectional study. **Methodology:** 62 patients (M=27, F=35) with shoulder pathology were taken. The timed functional arm and shoulder test included three tasks: hand to head and back, wall wash, gallon jug lift. The score of Timed functional arm and shoulder test was taken by two testers for inter rater reliability and by one of testers after a gap of seven days for intra-rater reliability. **Result:** The study demonstrated intra-class correlation coefficient (ICC) with standard error of mean (SEM) of 1.000 and 0.06843 for inter-rater reliability and 0.972 and 0.65491 for Intra-rater reliability. A Bland Altman limit of agreement has also confirmed that inter-rater and intra-rater were within the limits of agreement in 95% of occasions. **Conclusion:** Thus from this study, it could be concluded that the inter-rater and intra-rater reliability of Timed functional arm and shoulder test (TFAST) was “high” in patients with shoulder pathology.

Keywords: Functional test, Reliability, Shoulder Pathology, TFAST

INTRODUCTION

The shoulder joint is one of the more mobile joints in the body and restriction can have a significant effect on function ability [1, 2, 3]. Shoulder pain is very common, in fact 1% of adults over the age of 45 present with this symptom to their general practitioner each year and due to the complexities of the anatomy and physiology, it is difficult to achieve definite diagnosis using the patient history alone [4,5,6,7]. Regular tracking of arm and shoulder functional performance is critical to aid decision making throughout the course of the rehabilitation program,

including return-to-work or sport-to-sport decisions [8]. Clinical evaluation of patients with shoulder pain and dysfunction presents a unique challenge to the musculoskeletal specialist [9]. There exists a large or various numbers of instruments and scales that measure symptoms and function of shoulder [10]. There are various performance based measures used for athletes [11, 12, 13, 14, 15, 16, 17], none appear to be commonly used for patients with lower-level upper extremity functional demands, for example, non athletes and older adults. The functional test like push up and push up plus test are not feasible for a majority of patients, especially older patients, who commonly have shoulder impairments along with other chronic musculoskeletal conditions [18, 19]. The study done by Shah et al [8] have developed a timed functional arm and shoulder test and have established reliability in asymptomatic individuals and feasibility in few symptomatic patients. There is lack of literature measuring the reliability of timed functional arm and shoulder test in symptomatic populations. Thus the purpose of this study is to test the intra-rater and inter-rater reliability of Timed Functional Arm and Shoulder test (TFAST) test in patients with shoulder joint pathology.

METHODOLOGY

In this study, 62 symptomatic patients were included. Sample size was calculated based on test-retest designs, and agreement between the raters. According to that if assumptions kept as the observed R will be 0.80 or greater with a lower 1-sided 95% confidence interval i.e. CI=0.10 (i.e., R acceptable \geq 0.70). Therefore 55 patients are required. And with 5% drop out rate, total of 59 patients are required [20, 21]. Thus, total 62 patients were evaluated with no drop outs. **Inclusion criteria** (a) Age (19-85 years); (b) Both genders i.e. males and females were included; (c) Pain in shoulder joint greater than 3 months; (d) Any affected right or left upper limb patients were included; (d) Subject with any shoulder pathology; (e) Subject willingness to participate. **Exclusion criteria:** (a) Recent injury; (b) Any fixed deformity or contracture; (c) Any disability present; (d) Recent surgery; (e) Recent fracture; (f) Acute cases; (g) Any neurological conditions; (h) Cardiovascular or respiratory problem.

Procedure: A total of 62 patients were selected from out-patient department of S.S. Agrawal institute of physiotherapy, Navsari and Pramukh Swami Hospital, Surat. Basic demographic information, including age, height, weight, dominant and affected side as well as pain intensity by visual analog scale was collected from all the patients. Consent was obtained from all the patients and the patients were screened through various tests, ROM, capsular tightness according to pathology and test presented in table 1.

Table 1: Assessment of shoulder pathology

	CONDITIONS	EXAMINATION
1.	Frozen Shoulder	<ul style="list-style-type: none"> ➤ Apley’s scratch test ➤ Capsular Tightness ➤ Range of motion ➤ Joint play
2.	Rotator cuff tear	<ul style="list-style-type: none"> ➤ Empty can test ➤ Full can test ➤ Manual muscle testing
3.	Impingement	<ul style="list-style-type: none"> ➤ Neer impingement test ➤ Hawkins kennedy test ➤ Range of motion
4.	Acromioclavicular joint pathology	<ul style="list-style-type: none"> ➤ Paxison’s sign test ➤ Acromioclavicular painful arc
5.	Rheumatoid arthritis	<ul style="list-style-type: none"> ➤ Blood report RA factor positive ➤ Morning stiffness > 3 months
6.	Post operative stiffness	<ul style="list-style-type: none"> ➤ Range of motion ➤ Manual muscle testing
7.	Supraspinatous tear	<ul style="list-style-type: none"> ➤ Empty can test ➤ Full can test ➤ Manual muscle testing of supraspinatus muscle
8.	Mechanical shoulder pain	<ul style="list-style-type: none"> ➤ Range of motion ➤ Manual muscle testing ➤ Joint play

The patients were included for the study with positive test according to pathology, capsular pattern positive, decreased in ROM, weakness of muscle and hypo mobile joint.

The test consisted of 3 basic tasks that encompass the constructs of ROM, endurance, and strength, and took a total of about 10 minutes to complete on both arms. Patients also completed the SPADI and PSS function subscale questionnaires after screening procedure [22, 23]. All SPADI items are originally scored on a visual analog scale (VAS) from no pain/no difficulty to worst pain imaginable/so difficult. The PSS function subscale is scored from 0 to 60, with lower scores indicating more functional impairments. The entire screening procedure was done by one tester apart from the two testers taking the final test. Measurements were obtained by the two testers in order to test the inter-rater reliability of timed functional arm and shoulder test. Measurements were taken by the same tester on two different days with seven days interval for intra-rater reliability. The test content and procedures were briefly explained to each tester, but no specific training was conducted. The test sessions began with standardized verbal instructions and tester demonstration of each task. The patients were not given any trial or practice. The test was conducted with the procedure as mentioned by shah et al [8]. The details of task are:

Task 1: HHB (Head to hand and back) Internal and External Rotation

This test was timed for 30 seconds. The test began with the arm at the side, followed by reaching up and touching the back of the head. Any part of the hand, ideally full palm, touching the head was acceptable. After the patient touched the back of the head, the patient brought the arm down to touch the dorsal surface of the hand to the small of the back. The motion was repeated for the duration of the test. Each time the patient touched the back of the head, it was counted as 1 repetition. Total repetitions performed during the task were recorded and the test was repeated for the other arm.



Figure 1: Hand to head and back

Task 2: Wall Wash: Inward and Outward Motion

This test was timed for 60 seconds in each direction. The patients were instructed to move the hand and arm in circular motions at shoulder height. The centre of the circle was at the shoulder height of the patient, with marks drawn at 6 inches up, down, left, and right to make a circle that was 12 inches in diameter. The test began with the hand holding a scrubber on the top mark. Keeping the scrubber in full contact with the wall, the individual externally rotated (outward motion) the arm so that the scrubber touched each of the 4 marks. Each time the hand passed the top mark, it counted as 1 rotation. Total repetitions were recorded for

60 seconds. The same test was performed for the opposite direction (inward motion or internal rotation), and then both motions were performed on the other arm.

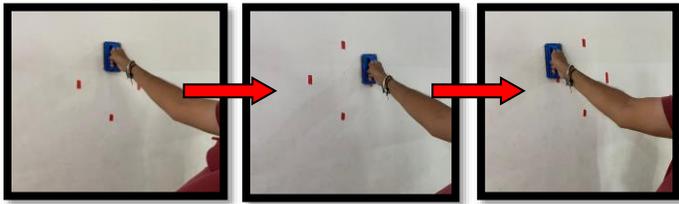


Figure 2: Wall wash

Task 3: Gallon-Jug Lift

This test was timed for 30 seconds. The height of the counter was 36 inches from the floor, and that of the shelf was 20 inches above the counter. The jug used was 3.78 kg in weight. The patient lifted the jug from the counter height, then tapped it lightly on the shelf and immediately brought it back down to the counter height. This movement was repeated as many times as possible in 30 seconds without resting the jug on the shelf. Every time the jug touched the shelf, it counted as 1 repetition. The total repetitions were recorded and the test was repeated on the other arm.



Figure 3: Gallon Jug Lift

Each patient was given these standard instructions: “Please perform all the three tasks as quickly and safely as possible without pain and do as many repetitions as possible within the time limit and can take break if needed. The time will continue to run during your break.” The patients were given zero score in case they were not able to perform the task. Rest periods of 30 seconds were provided between all tasks. The test was conducted on unaffected side first followed by affected side. In case of bilateral affected side, the one with less pain was tested first. For each task, total repetitions were recorded and used to calculate the total TFAST score, such that all tasks were represented equally for a 30-second period. For the wall-wash task, the repetitions for the inward and outward directions were added, then divided by 4 to represent 30 seconds of data: $[HHB + (\text{wall wash inward and outward}/4) + \text{gallon-jug lift}]$ [8].

Both the testers recorded the score on the scoring sheet and in order to avoid the exchanging of information, both testers were blinded to the score taken by each other. This procedure was followed for inter-rater reliability.



Figure 4: Testers scoring Timed Functional Arm and Shoulder test for Inter-rater reliability

Patients were not told the scores that they achieved during first test so as to avoid bias on the results of performance level of the subjects, and the procedure was repeated after seven days and data thus obtained was used to calculate for intra-rater reliability. The same testing procedure and equipment was used for all the patients.



Figure 5: Tester scoring Timed Functional Arm and Shoulder test for Intra-rater reliability

Results: In this study, total 62 patients with shoulder pathology were taken.

Table 2 shows the descriptive statistics as mean and standard deviation with minimum and maximum values for all patients.

Table 2: Descriptive statistics of patients

	Minimum	Maximum	Mean	Standard Deviation
Age (years)	19	84	56.35	11.96
Height (meters)	1.44	1.85	1.6297	0.94
Weight (kgs)	47.5	111.5	70.848	13.56
VAS (cms)	0	8.9	5.089	1.86
SPADI	5.4	72.3	35.778	17.45
PSS	20.00	72.0	53.545	9.32

Table 3 showed the descriptive statistics as mean and standard deviation with minimum and maximum values for Timed Functional Arm and Shoulder test (TFAST). Descriptive statistics showed good reliability.

Table 3: Descriptive statistics of TFAST

	Minimum	Maximum	Mean	Standard deviation
Tester 1	0.00	93.00	44.33	18.43
Tester 2	0.00	92.50	44.27	18.43
Retest	11.75	93.00	47.90	18.96

Table 4 showed the intra-class correlation coefficient (ICC) for the inter-rater reliability taken by the tester 1 and tester 2 along with confidence interval (CI) with a p value < 0.05. The ICC value showed good reliability.

Table 4: ICC (Inter-rater reliability) with CI

ICC (inter-rater)	CI (upper)	CI (lower)	p value
1.000	1.000	1.000	0.000

Table 5 showed the intra-class correlation coefficient (ICC) for the intra-rater reliability taken by the tester 1 twice along with confidence interval (CI) with a p value < 0.05. The ICC value showed good reliability.

Table 5: ICC (Intra-rater reliability) with CI

ICC (intra-rater)	CI (upper)	CI (lower)	p value
0.972	0.988	0.906	0.000

Table 6 showed the intra-class correlation coefficient (ICC) for the inter-rater and intra rater reliability of all tasks of TFAST taken by the tester 1 and tester 2 along with confidence interval (CI) with a p value < 0.05. The ICC value showed good reliability.

Table 6: ICC (Intra and Inter -rater reliability)

	Inter -Rater	Intra -Rater	p Value
HHB	1.00 (1.00 - 1.00)	0.917 (0.956 - 0.825)	0.000

WVO	0.998(0.999 – 0.997)	0.977 (0.988 - 0.950)	0.000
WWI	0.999 (0.999 – 0.998)	0.978 (0.988 – 0.958)	0.000
GL	1.000 (1.000 – 1.000)	0.986 (0.993 -0.961)	0.000

The Bland-Altman chart was a scatter plot with the difference of the two measurements for each sample on the vertical axis and the average of the two measurements on the horizontal axis.

Three horizontal reference lines are superimposed on the scatter plot - one line at the average difference between the measurements, along with lines to mark the upper and lower control limits of plus and minus 1.96*sigma, respectively, where sigma was the standard deviation of the measurement differences.

If the two methods were comparable, then differences should be small, with the mean of the differences close to 0 [24].

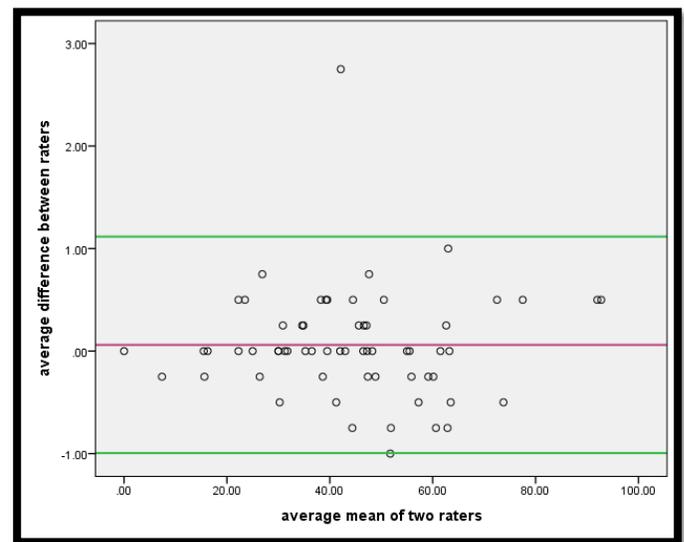


Figure 6: Bland- Altman limits of agreement analysis between two testers

It showed reasonable agreement between the testers as most of the values fall in $M \pm 2SD$ ($p < 0.05$). It indicates excellent reliability.

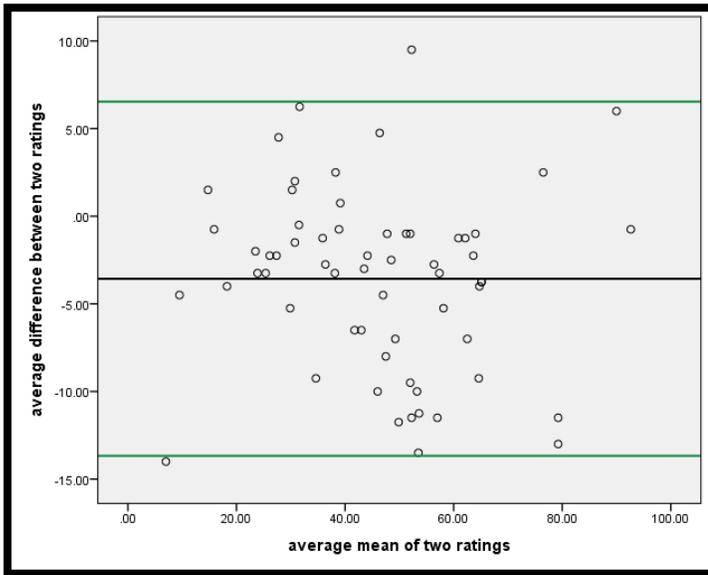


Figure 7: Bland -Altman limits of agreement analysis between scores taken by the same tester twice

It showed reasonable agreement as most of the values fall in $M \pm 2SD$ ($p < 0.05$).

The SEM was a measure of absolute reliability- the smaller the SEM the more reliable the measurements [25, 26].

The SEM value calculated for variability in measurements between the two testers was 0.06843 which was very small; whereas the variability in measurements of same testers is 0.65491 which was very small. Thus these measurements were reliable.

Table 7: SEM values

	Variability in measurements between two testers	Variability in measurements of same testers
SEM	0.06843	0.65491

The true SEM value for variability in measurements between two testers ($0.06843 * 1.96 = 0.13412$) suggests that any individual value lies within the range of ± 0.13412 TFAST from their measured value.

The true SEM value for variability in measurements of the same testers ($0.65491 * 1.96 = 1.28362$) suggests that any individual value lies within the range ± 1.28362 TFAST from their measured value.

Table 8: True SEM Values

	Measurement between two testers	Measurement between same tester
True SEM	0.13412	1.28362

The smallest real difference (SRD) value for variability of measurements between the two testers ($1.96 * \sqrt{2} * SEM = 0.18911$) and between the measurements taken by the same tester ($1.96 * \sqrt{2} * SEM = 1.80990$) was claimed to be capable of representing the “real” change [16, 17].

Table 9: SRD values

	Measurement between two testers	Measurement between same testers
SRD	0.18911	1.80990

Discussion: In this cross-sectional study, which aimed at measuring the intra and inter rater reliability of TFAST (Timed Functional Arm and Shoulder Test) in patients with shoulder pathology by using three different tasks which are hand to head and back, wall wash and gallon-jug lift, the reliability estimates ranged from satisfactory to excellent for both intra-rater and inter rater conditions.

In clinical practice, it was common for patient to be evaluated several times by same or by different examiners. Therefore it was important to know reproducibility of measures and tasks used by the same tester on different occasions as well as by different testers [27].

As found in this study, the intra-class correlation coefficient of individual task as well as for total TFAST for the inter- rater reliability and intra-rater reliability was 0.90 or higher for all patients. When compared the total TFAST score, almost 80% of patients have less score of TFAST on affected side compared with unaffected side. This can be because out of total 62 patients (58 right dominant, 4 left dominant) 50% of patients had the affected arm same as dominant which can lead to more problems in activities of daily living and 50% of patients had affected arm as of non-dominant. The variations can be due to difference in level of disability in SPADI and PSS score eg: some patients had severe disability whereas other had mild to moderate disability.

Comparing the individual task, in HHB almost 75% of patients had fewer score on affected side as compared to unaffected. For wall wash, all patients had less score on affected side as compared to unaffected side with wall wash inward score more affected compared to unaffected. For gallon jug lift, affected side score was less compared to unaffected side. In gallon jug lift task 50% of patients could not lift the jug; with the need to reduce the half gallon size for jug lift to be able to complete the task. With

this exception, all the patients were able to complete all tasks without significant pain. When score of individual task as well as total TFAST score was compared with normative values as documented in the article by Shah et al [8] all the patients had less score in all three tasks according to age matched group of asymptomatic individuals. Thus this suggests lower level of performance level of all patients and need for proper rehabilitation. Use of the TFAST would most logically be to measure the progress (or deterioration) of a patient or participant over time.

Out of 62 patients, the number of patients in different shoulder pathology are categorized (38= frozen shoulder, 5= rotator cuff, 4= AC joint pathology, 3=supraspinatous tear, 1= impingement, 4= mechanical shoulder pain, 1= rheumatoid arthritis, 1= subacromial bursitis, 5= post operative stiffness. In patients with frozen shoulder, HHB task was more affected as compared to another two tasks. This can be due to the fact that capsular pattern is positive for these patients and patients present with difficulties in external and internal rotation. This is in accordance to the study by Rundquist et al [28] which states that external rotation range is limited by anterior capsule, rotator interval capsule and superior glenohumeral ligament and internal rotation range is due to capsular tightness in posterior band of inferior glenohumeral ligament complex. Thus the patients had problems in external and internal rotation range.

For conditions like rotator cuff pathology, mechanical shoulder pain, post operative stiffness, rheumatoid arthritis, impingement syndrome, AC joint pathology, patients had fewer repetitions in wall wash task. The inward and outward motion of shoulder can be affected due to loss of scapular stability and loss of stabilizing function as well as weakness of rotator cuff muscles. The gallon jug lift task was also affected for these patients and almost 50% of patients could not lift the gallon jug which might be due to weight of jug which was unable for the patient to lift due to weakness in strength and endurance of shoulder muscles. There are various self report scales and tools available to measure the functionality level of patients [10, 29, 30, 31, 32, 33, and 34]. But all the scales and tools have multiple domains. Though these scales are quick and easy tools to understand the patient's perception of his or her pain, disability, and function, which are important outcome measures but self-report measures of function based on a patient's perception often differ from direct measures of functional performance [8]. The TFAST is quick and easy to perform and takes less time.

There are various tests in the literature to measure functional performance [11, 12, 13, 14, 15, 16, and 17]. Most of the test evaluates only elevation activities whereas the day to day activities involves rotational activities too. The FIT-HaNSA requires special hardware and equipment and the score is based on the time to complete the test. In contrast, the TFAST scores were calculated based on number of repetitions performed at a self-determined speed within the allotted time; therefore, more repetitions indicated greater power and functional performance.

Tests such as the simple shoulder endurance test [11], function-related tests [17], and gallon-jug shelf transfer [35] only test 1

construct of function (stability, mobility, and strength, respectively) of the upper extremity. Further, the simple shoulder endurance test demonstrated only moderate test-retest reliability (ICC = 0.59) in a group of asymptomatic individuals. In contrast this study shows excellent reliability in group of symptomatic populations. The tasks were chosen and performed in a specific order based on the understanding that each task would be progressively more difficult compared to the previous one; thus, the TFAST was performed beginning with the HHB task, then the wall-wash tasks, and finally the gallon-jug lift.

Standardisation of protocol was also very necessary for the proper result of inter- and intra-rater reliability. The same protocol with the testing in same setting and environment was followed for inter rater and intra rater reliability. In all test situations there was a learning effect that may improve test results of the second test [36]. The choice of seven days between tests was made to limit the learning effect. The time period between repetitions of the measures should be long enough to avoid memorisation of data by examiners, but short enough to ensure that there were no clinical changes in the patients. It was recommended that 1 or 2 weeks would be ideal, but there may be reasons for the choice of another interval [37].

In this study, the findings of Bland Altman limits of agreement showed excellent inter-rater agreement between the raters indicating that measures related to the tester 1 were in agreement with the tester 2 in 95% of occasions. Similarly, we found excellent intra-rater agreement which means that measures relating to first test were in agreement with the second test in 95% of occasions.

This study also found SEM of 0.06843 for inter rater and 0.65491 for intra rater reliability. The true SEM for inter rater is 0.13412 and intra rater is 1.28362 which suggest the absolute measurement error. The SRD value for inter rater and intra rater is 0.18911 and 1.80990 which suggest that there should be at least change of these values so as to say that "real" change has occurred.

The scoring of inter-rater reliability was taken by both the testers together so that duration of contraction or fatigue has homogenous effect on all patients and moreover to avoid the effect of fatigue on the performance level of the patients. If the scores were taken at different times, than it would be difficult to decide that scores were result of true performance of the patient or has fatigue affected the level of performance of patient.

CONCLUSION: Thus from this study, it could be concluded that the inter-rater and intra-rater reliability of Timed functional arm and shoulder test (TFAST) was "high" in patients with shoulder pathology. However the studies should be done taking particular age group of patients and taking patients with same level of disability. Also the studies should be done with particular conditions so that normative values for patient population can be established.

Limitations of study: Data were generalized to all patients with shoulder pathology. Patients of wide age group were taken. Blinding of the testers was not possible. To minimise the error on results of patients, both the testers didn't discuss anything during the recording of the scores.

CONFLICT OF INTEREST: NONE DECLARED

ACKNOWLEDGMENT: We deeply thank I/C principal Dr. Hetvi Shukla for keeping faith in us and her throughout support. We would extend our gratitude towards all the patients who cooperated for the study.

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A review of the catalytic oxidation activity of mixed and pure tin-antimony oxides: Part-I

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DOI: 10.29322/IJSRP.10.09.2020.p10589

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10589>

Abstract- This paper covers the extensive review of the work done on the catalytic oxidation characteristics of tin-antimony oxides which are excellent oxidative de-hydrogenating catalysts as Part-I, which is covering the work done till the year 1980 and Part-II would cover the work reported from the year 1980 and onwards. The reported work on catalytic oxidation activity of catalysts has been discussed in the light of studies related to surface area, Temperature Programmed Desorption (T.P.D.), surface acidity, x-ray diffraction, Mössbauer effect keeping basic reaction of oxidation of methyl alcohol in focus.

Index Terms- Antimony, binary liquid solutions, catalytic oxidation, preferential adsorption, mixed and pure metal oxides, Mössbauer effect, review, surface excess oxygen, tin, T.P.D., Temperature programmed desorption

I. INTRODUCTION

The concept of geometric and energetic heterogeneity of solid catalyst surfaces was introduced by Taylor [1,2] in 1925. Since then, the importance of heterogeneity in chemisorption and catalytic processes is well accepted.

Catalytic activity is now invariably attributed to the surface coordinative unsaturation rather than the bulk properties of the solid. It is also well known that the occurrence of different crystallographic faces of edges of intersecting planes, steps, point defects and dislocations are taken into account, the coordination numbers of surface atoms may vary over wide ranges. The experimental evidence in general, indicates that the surface atom with lowest coordination number or highest valence unsaturation is the site responsible for highest valence unsaturation is the site responsible for highest activity. The low sensitivity versus valence unsaturation exhibited by some solids have also been successfully explained by various researches with the help of internal compensation effects [3] or surface reconstructions during the course of the reaction. The problem, however, does not appear to be well understood still [4]. Information regarding the effect of environments on the nature of the active sites has been reported by Cimino and Pepe [5,6], Stone and Vickerman [7] and Pepe and Stone [8]. They have reported that when a catalytically active ion such as Cr^{3+} is embedded in an inactive oxide matrix i.e. $\alpha\text{-Al}_2\text{O}_3$, the oxides expose the cations to oxygen ions and hydroxyl group(s) often in the unusual coordination numbers. Thus, the surface coordinative unsaturation may be considered as the cause for the activity of the various surface sites. Similar information is available in the studies reported by many other workers as well [9-11]. A wide variety of potentially active single or multicentre sites may be present on the oxide catalyst surface. There may be sites that are distinct with respect to their chemical nature and there is a certain energy distribution for chemically equivalent sites. Thus, in heterogeneous catalysis, a vital interest for study is the chemical nature of surface sites in general and information regarding catalytically active sites, in particular their energy distributions and their absolute number per unit area. Independent knowledge of the chemical nature of an active site will provide an important and complementary information in addition to more easily accessible data on the behaviour of reactant. Many attempts have been made in correlating catalytic activity with electrical conductivity, magnetic permeability surface morphology, porosity and crystal geometry etc. With the help of a number of sophisticated instrumental methods of analysis such as thermal methods of analysis, micro-calorimetry, magnetic susceptibility, x-ray analysis, x-ray fluorescence (XRF) spectroscopy, low energy electron diffraction (LEED), transmission electron microscopy (TEM), scanning electron microscopy (SEM), infrared (IR) and ultra violet (UV) spectroscopy, field ion spectroscopy and Mössbauer spectroscopy etc. which have opened a new Vista in the field of catalytic research. Several reviews, articles and monographs [12-19] are available for updating the knowledge of the research done and being carried out in the field of catalysis.

Among the industrially important catalysts, the most common active components are the metal oxides. Balandin *et al* [20] have attempted to correlate the catalytic activities of the metal oxides with the position of the metal in the periodic table. Emmett [21] has made a classification of various metal oxides according to the type of catalytic reaction involved.

Of the numerous oxides, oxides of tin and antimony [22] you have become important, particularly because of the selective oxidation and the ammonoxidation of n-propane for the manufacture of acrolein and acrylonitrile. Similarly, tin and molybdenum oxides are very useful for the conversion of propylene to acetone, acrolein and acetic acid. The importance of tin-molybdenum oxide is further established by the fact that till 1970, the synthetic method of the selective formation of ketone [23] by one step oxidation of olefins was not reported except the oxidation using $\text{PdCl}_2\text{-CuCl}_2$ catalyst in aqueous medium [24]. These oxides i.e. tin-antimony and tin-molybdenum, form the subject of our studies. A brief review of the work is given below.

II. CHARACTERIZATION OF SURFACES OF MIXED AND PURE METAL OXIDES

The surface of all the oxide catalysts is generally hydrated or hydroxylated. This may be due to the reaction with solution use in the preparation or through the reaction with atmospheric moisture. Water is lost in steps when the oxide samples are activated at different temperatures and it has been shown [25] that the water present is either as bulk water or in the surface hydroxyl form. Different forms of metal oxygen functional groups are left by surface hydroxyl groups when water is removed as a result of different activation temperatures [26].

Wakabayashi *et al* [27] have studied the effect of composition of the catalyst and the temperature of activation the colour and catalytic activity. Hernimann *et al* [28] investigated the relationship between the bulk and surface composition of tin and antimony oxide catalysts and oxidative dehydrogenation of 1-butane to butadiene in the light of calcination temperature. It was shown that the specific activity for the formation of butadiene from 1-butene maybe directly related to the concentration of antimony cations at the surface. It was proposed that the isolated antimony cations surrounded entirely by Tin ions in nearest neighbour sites constituted and active site for the formation of butadiene. Lazukin *et al* [29] have reported the presence of Sb (III) and Sb(V) in solid solution in SnO₂.

On the basis of X-ray data, they have shown [27] that the colour of the catalyst was attributed to the formation of solid solutions. They also concluded that the formation of acrolein from propylene is closely connected with the formation of solid solution formed between Sn and Sb oxides. Trimm and Gabbay [22] have also shown that the oxidation of butene isomers to butadiene occurs over solid solutions of Sb₂O₅ in SnO₂, in which Sn⁴⁺ ions play an important role.

Goldin *et al* [30] have shown that catalytic oxidation of propylene to acrolein occurs over the SnO₂+Sb solid solution component and is attributed to a reaction of Sb⁵⁺ ions in octahedral coordination sites. The selectivity was shown to be affected by physical structure of the catalyst and shows a decrease with surface area.

Sala and Trifiro [31] have studied the effect of heating in solid state on the bulk and surface properties by spectroscopic and thermogravimetric methods and have concluded that Sb₂O₅ present on the surface makes the catalyst active for oxidizing and isomerization reactions. The oxidizing sites of Sb₂O₅ were attributed to the presence of double bond between antimony and oxygen atoms or to surface defects. Calcination was found to destroy the surface reactivity of pure oxides but not of the mixed ones. Roginskaya *et al* [32] suggested that transformation of Sb⁵⁺ to Sb³⁺ must be obtained. Lazukin *et al* [33] have studied the mixed oxides containing tin and antimony in 90: 10 to 10: 90 ratios. They have attributed the catalytic activity to the solid solution and no effect was noticed for the catalyst composition. Bakshi *et al* [34] have studied the catalytic oxidative dehydrogenation of n-butene and have reported optimal reactivity and selectivity for catalysts having atomic ratio Sn:Sb in the range of 1:1 to 1:4. Sala and Trifiro [35] investigated the relationship between structure and activity of antimony mixed oxides in 1-butene oxidation. It was proposed that the oxidative dehydrogenation properties of the catalysts are due to two: "gem", i.e. Sb⁵⁺=O groups and that the role of second metal is to adsorb the gaseous oxygen to re-oxidize the reduced antimony ions. Free antimony oxides dispersed in mixed oxides exhibited reduction rate higher than pure antimony oxides. This property was found to be decreased by a high temperature calcination.

Trifiro *et al* [36-38] have studied the oxidative dehydrogenation and isomerization of n-butene and have attributed the catalytic activity to the presence of Sn at valence lower than 4 and attributed to deactivation observed during the oxidation reaction of low amount of reaction lattice oxygen in Sn-Sb oxides. Irving and Taylor [39] studied the acidic properties of mixed tin and antimony oxide catalyst in relation to the isomerization of olefins. They have shown that isomerization takes place at the Brønsted acid sites which acts as a source of protons. However, no relationship between surface acidity and oxidative activity was found.

Irving and Taylor [40] in other studies have proposed that dehydrogenation involved a π -allyl intermediate, while isomerisation occurred through carbonium Ion formation tin- antimony oxide. The conclusions of Boudeville *et al* [41] are in good agreement with that of Cross and Pyke [42] who also studied the XPS spectra of the surface composition of tin and antimony mixed oxide catalysts and have shown that, at elevated temperatures, the surface became rich in antimony composition.

Molybdenum based oxide catalyst has been studied by Chopra *et al* [43]. They have studied the effect of catalyst composition the H₂O₂ decomposition. Catalytic oxidation of olefins over oxide catalysts containing molybdenum were studied by Tan *et al* [44]. They selected Co₃O₄- MoO₃ and SnO₂-MoO₃ catalysts. The surface area of the Sn-

Mo oxides catalyst was 45.6 m²/g. Propylene was converted to acetone at 100- 160°C with more than 90% selectivity over SnO₂- MoO₃. Isobutene was converted to t- butyl alcohol and di- isobutene over SnO₂-MoO₃ and to α-methyl acrolein over Co₃O₄- MoO₃. They proposed that the active sites seemed to involve an acidic point which was formed by the combination of tin or Cobalt oxide with molybdenum oxide. Moro-Oka *et al* [23] found that Co₃O₄-MoO₃ was an excellent catalyst for the oxidation of propylene to acetone. They have also shown [45] that systems containing SnO₂, Cr₂O₃, NiO and Fe₂O₃ were also found to be effective for that reaction.

Buiten [46] has found that MoO₃ did not form a bulk compound with SnO₂. It could be found at the SnO₂ surface, which then exhibited a peculiar catalytic activity for the oxidation of propylene by molecular oxygen mainly to acetic acid along with acetone while pure SnO₂ oxidized propylene mainly to CO₂ and CO and a considerable portion was converted into acrolein. MoO₃ was found to be much less active. Buiten [46] prepared Sn-Mo catalyst by mixing SnO₂, MoO₃ and SiO₂ in desired ratio and activating at 450°C. X-ray examination did not indicate any compound formation. These results were supported by Doyle and Forbes [47]. On the other hand, Lazukin *et al* [48] activated the Sn-Mo catalyst at less than 600°C and reported that their catalyst contained solid solutions of MoO₃ in SnO₂ and the compound SnO₂. 2MoO₃.

Moro-Oka *et al* [49,50] have studied the oxidation of propylene to acetone over molybdenum oxide with TiO₂, Fe₂O₃, Cr₂O₃, CrO₃, SnO₂, V₂O₅, NiO, CuO and ZnO. Of all the above mixed oxides, SnO₂-MoO₃ showed the highest activity for oxidation. X-ray, IR and Diffuse reflectance spectroscopic studies were made for Bi₂O₃. MoO₃ with effect of promoters such as BiPO₄, Fe₂O₃ and Cr₂O₃ by Batist *et al* [51]. A new compound was detected and was supposed to be responsible for the catalytic activity of Bi₂O₃.3MoO₃+Fe₂O₃.3MoO₃ catalyst for the conversion of butene to butadiene.

The surface and catalytic properties of mixed oxides have been a subject of a large number of studies. Vadekar and Pasternak [52] have reported that the efficiency of the hydrogenation catalysts is increased by the presence of hydrogen halides in the reacting gases. A patent of Imperial Chemical Industries. [53] mention that tin-antimony oxide catalyst gives higher yields in ammonoxidation of propylene in the presence of volatile halogen compound in the reacting gas. It may be due to an inorganic halogen compound on the surface of the catalyst. It has been shown that the activity and selectivity of the catalysts depend on the composition among other things [27, 29, 34].

The work of Maslyanskii and Bursian [54] and of Givaudon *et al* [55] on chromia-alumina catalyst implied that chromia contains adsorbed, or excess oxygen when oxidised. The surface excess oxygen was held responsible for the production of water as indicated by heat effects during oxidation- reduction cycle on chromium oxides by Dickinson [56]. The catalytic activity of certain metal oxides has been successfully correlated with their surface oxygen.

Mellor *et al* [57] have used KI oxidation to estimate the surface density and strength of oxidizing centres on silica-alumina catalysts. They concluded that salts interact strongly and directly with the oxidizing centres in silica-alumina catalysts and the anions compete successfully with water for adsorption. Flockhart and Pink [58] have also found that treating silica- alumina with salts with their activity for forming cation-radicals from perylene.

Uchijima *et al* [59] used potassium iodide solutions of pH between 7.5 and 11.5 to establish a distribution in the oxidation power of surface excess oxygen has been found to be a useful variable to represent the activities of various catalysts; for example, in the oxidation of ammonia on Nickel oxide, Cobalt oxide and manganese oxide catalysts [60]. The decomposition of hydrogen peroxide on Nickel oxide [61] and chromia catalysts [62-65] has revealed a good correlation between their catalytic activities and their amount of excess oxygen. Bielanski *et al* [66] and Weller and Voltz [67] have determined the surface excess oxygen by reduction with Cl⁻ or I⁻ ion in strongly acidic medium. Yoneda [68] proposed regional analysis and reported that the catalytic activities of some solid acids were duly represented by a linear combination of the acidic strength distribution of the catalysts. The quantitative correlation for excess oxygen distribution over oxides for an oxidation- reduction catalysts also discussed.

Alkhozov *et al* [69] have studied the isomerization normal molybdates and tin containing molybdates. On the basis of the results, it was suggested that the isomerizing capacity of a catalyst may be used to evaluate its acidic properties. They also proposed that the activity of the catalyst increased as the more electronegative metal was introduced. They also discussed the advantage of their methods for the determination of acidity over the methods proposed such as Hammett indicators [70] and those involving adsorption of ammonia and pyridine [71]. A clear relationship between the activity and acidity of a large group of oxide systems supported an earlier suggestion

[72] that the acidity of the catalyst under conditions for the catalytic oxidation of olefins can characterize their activity for the isomerization of butene. Formation of peroxy radicals on the tin oxide surface was detected by Hoof and Helden [73] during ESR studies. The role of surface acidic centres in the extensive oxidation of 1-butene over molybdenum oxide- based catalyst was studied by Forzatti *et al* [74]. They proposed that Brønsted sites were transformed into Lewis sites at high temperature.

Ai [75-80] has concluded that the catalytic activity is well interpreted in terms of the acid- base properties of the catalysts, such as in the case of many other V₂O₅ or MoO₃ containing catalyst. Ai [76] studied oxidation activity and acid-base properties of SnO₂-MoO₃ and SnO₂-P₂O₅ system. The acidities of the SnO₂-MoO₃ catalyst were dramatically high when the molybdenum content was in 32-60 atom % range and those of tin oxide rich (Mo < 20 atom%) and molybdenum oxide rich (Mo >80 atom %) catalysts were fairly low. The basicity remarkably enhanced by the introduction of small amount of MoO₃ (Mo <5 atom%). It was inferred that the catalysts are basic in the MoO₃ poor compositions.

Buiten [81] has proposed that reaction between propylene and acidic surface hydroxyl groups yield surface bonded isopropyl groups which constituted the intermediate species in the oxidation of propylene to acetone and acetic acid. Infrared measurements revealed that deuterium appears preferably in the methylene group (as was confirmed by Proton magnetic resonance measurement) and for the greater part in the cis-position with respect to methyl group.

III. TEMPERATURE PROGRAMMED DESORPTION (T.P.D.) STUDIES

It is a well- accepted fact that the catalytic reactions occur on the active centres which are specific and thorough information is very necessary for the preparation of a good catalyst. Today many desorption techniques are available for obtaining the information about the active centres present on the surface. The important desorption methods used are Thermal Desorption, Electron Stimulated Desorption, Field Desorption, Mass spectrometry, Photon and phonon Desorption etc. The information about the surface concentration, stoichiometry and nature of the surface species can be obtained by these methods. The desorption process kinetics and surface reactions preceding desorption can be deduced and are of importance in understanding of the mechanism of catalytic processes. If the amount of the gas can be measured then surface analysis can be made, but equally important is the kinetic information which can be derived from the rate of desorption. The desorption rate is generally governed by Arrhenius (or Polanyi-Winger) equation,

$$-\frac{dn}{dt} = k_d n^x = v_x \exp\left(-\frac{E^+}{RT}\right) n^x$$

Where n is the surface concentration of the desorbing species per unit area, K_d the rate constant for desorption, "x" the order of desorption process, v_x the pre- exponential (or frequency factor) and E⁺ the activation energy for desorption. Thus, the desorption rate is extremely temperature sensitive. A temperature programmed desorption method is in principle similar to flash- filament desorption method reviewed by Ehrlich [82]. However, it differs from it in several respects. In T.P.D. studies, information can be obtained for the conventional metal oxides catalysis in addition to metal catalysts. The conditions employed in T.P.D. studies are much more similar to those ordinarily used in the catalytic reaction than in the case with the flash-filament method. T.P.D. technique has been successfully employed for the study of active sites for olefin chemisorption by Amenomiya *et al* [83]. They studied temperature programmed desorption of ethylene from alumina surface and concluded that two types of active sites are present on the alumina surface for the chemisorption of ethylene. When higher olefins, such as propylene [84] and trans-butene-2 [85], were adsorbed on alumina and were evacuated at room temperature and then subjected to temperature- programmed desorption, a larger peak with a small shoulder on the high- temperature side was obtained. It was concluded that sufficient amount of physically adsorbed olefins was left on alumina, presumably because of their higher boiling points. Amenomiya and Cvetanovic [84,85] concluded that olefins are selectively adsorbed on the active sites rather than a random adsorption the whole surface. Ohno and Yasumori [86] also studied the T.P.D. of ethylene on γ- alumina. Amenomiya and Cvetanovic [87] found by T.P.D. technique that active sites of alumina developed sharply when the evacuation temperature was increased beyond 520°C. Amenomiya *et al* [88] demonstrated in a study of the polymerization of ethylene on alumina that T.P.D. is useful not only in identifying adsorbed states or active sites but may also help in understanding reaction mechanisms. T.P.D. technique is also useful in determining heats of desorption and surface heterogeneity. The values of heat of desorption of butene on alumina on site- I are in good agreement [85] with the values determined by

conventional desorption methods. The T.P.D. technique is also employed for calculating the activation energy of desorption. Amenomiya *et al* [89] studied the adsorption of ammonia on an alumina catalyst and its effect on the subsequent adsorption of ethylene was studied by flash-desorption technique. It was calculated that activation energy of desorption of ammonia increase from 7 to 18 kcal/mole as the surface coverage decreases from 29 to 1.5%. Finally, they concluded that the active sites for ethylene adsorption do not coincide with the highest energy sites for ammonia adsorption though they were within the distribution range for ammonia. Amenomiya *et al* [84,89] have shown that the peak shapes and desorption temperature peak maximum vary with the amounts of the adsorbed species for the systems propylene- alumina and ammonia- alumina respectively. From the values of T_M at different Q_i the surface coverage and the average activation energies of desorption E_d can be calculated as a function of surface coverage by using equation 2, if the corresponding pre-exponential factors are known.

$$2 \log T_M - \log \beta = \frac{E_d}{2.302RT_M} + \log \left(\frac{E_d}{AR} \right) \text{-----}(2)$$

Where, T_M is peak maximum temperature

β = heating rate

R = Rydberg constant

E_d = Activation energy of desorption

A = pre- exponential factor.

T.P.D. techniques have been used in the study of surface reactions [88] where Amenomiya *et al* studied the polymerization and hydrogen- deuterium exchange of ethylene on alumina. They concluded that as polymerization proceeds the ethylene peak gradually decrease with the simultaneous increase of the product peak. The position of product peak coincides with that of the second peak in butene desorption. Also, as the reaction proceeds, the front edge of the product peak gradually extends to lower temperatures while the rear edge remains unchanged. Simultaneously, the rear edge of ethylene peak gradually recedes from the high- temperature side. Thus, two molecules of ethylene were polymerised to give butene. Hydrogenation of ethylene on alumina have been reported by several investigators [90-93] at relatively high temperature (between 120°C and 500°C). However, the reactions have been found to occur even at room temperature and T.P.D. technique was used to study the reaction by Amenomiya *et al* [94]. They studied the hydrogenation of ethylene on alumina at low temperature (-20°C to 90°C). The reaction was found to occur at room temperature. Two different types of active sites were found to be present on the surface of alumina for the hydrogenation of ethylene. These were the same sites which were previously found by the same authors to be responsible for chemisorption and polymerization of olefins. However, the hydrogenation was found to occur more readily on the active sites on which chemisorption was weaker while polymerization of ethylene took place preferably on the other site. The surface was found to be heterogeneous as the results of hydrogenation suggested. Rivin and Illinger [95] studied the chemisorption of acetone on carbon blacks by T.P.D. technique. They proposed that chemisorbed molecules were present in a mobile phase and underwent a loss of translational entropy prior to desorption. When acetone was desorbed from the surface only one peak was observed at about 200°C which was resolve by analogue curve generator in four peaks with maxima at 140, 180, 230 and 280°C respectively. The study was also extended to silica gel [96] and the peaks observed were again resolved into four component peaks. Kondo *et al* [97] studied T.P.D. of carbon dioxide on nickel oxide catalyst and the oxidation of carbon monoxide to obtain information on the surface heterogeneity of the catalyst. Two peaks of CO_2 were observed in 80°C-120°C and 300°C-370°C range, with the activation energies of desorption of 8 and 25-27 kcal/mole respectively. From the studies, it was concluded that nickel oxide surface has two kinds of active sites and that the oxidation of CO at low temperature takes place on the stronger sites, characterized by the higher temperature peak of CO_2 , while the weaker sites were held responsible for the higher temperature reaction. It was also suggested that the stronger sites were composed of relatively labile and weakly bound oxygen atoms and the weaker sites of stable and strongly bound oxygen atoms. The chemisorbed state of oxygen on NiO was studied by Gay [98]. The T.P.D. study was carried out in vacuum when oxygen was adsorbed

at room temperature. T.P.D. study gave two major peaks, at about 70°C and 650°C-750°C respectively while at adsorption temperatures higher than 150°C another type of chemisorption characterized by a peak appearing at 320°C-360°C was obtained.

Desorption of some aliphatic alcohols (C₁- C₈) and fatty acids (C₁- C₅) on a rutile pigment surface was studied by Schreiber and Mackinnon [99]. They found that peak maximum temperatures were shifted to higher temperatures and as the boiling point of alcohol increased, all alcohols gave single peak of similar shape. However, the peak areas markedly decreased as the alkyl group became larger even after the areas were correlated for the sensitivity of detection. This was ascribed to steric barriers due to the adsorbate orientation on the surface. On this basis, the authors were able to calculate the average angle of inclination of the alkyl chain on the surface. Similar steric hindrance was also found for the fatty acids, but two desorption peaks were observed with formic and acetic acid at about 120°C and 290°C. The two peaks of formic acid on titanium dioxide were also observed by Munuera [100], who studied the mechanism of formic acid dehydration on titanium dioxide by I.R., T.P.D. and adsorption measurements during the reaction. Water on titanium dioxide was also investigated by T.P.D. The four peaks appeared at 250°C, 370°C, 400°C and 500°C respectively. From the results, it was concluded that the high temperature decomposition takes place through formate, whereas the low temperature reaction involves the formation of a protonated formic acid molecule. The adsorption of isopropyl alcohol on a zinc oxide catalyst by a T.P.D. technique was investigated by Kolboe [101]. By varying the experimental conditions, purposely such as very slow rate of N₂ (the carrier gas) and heating rate 4°C/min the obtained desorption spectrum indicated the existence of five different groups of adsorption sites. Further, the kinetics of dehydration of isopropyl alcohol on zinc oxide was explained by the same author [102]. Thermo-desorption of methanol, isopropanol, di-isopropyl ether and water were studied on alumina, and studies of benzene on nickel oxide- alumina were made by Yakerson *et al* [103]. They established multiple forms of adsorption and irreversible nature of chemisorption by studying chromatographically the thermo-desorption of methyl and isopropyl alcohols and di-isopropyl ether from alumina surface. On 40% NiO-Al₂O₃ benzene gave one symmetric peak at 190°C in T.P.D. carried out at a heating rate of 13.6°C/minute suggested that benzene was adsorbed in only one form. No decomposition occurred during adsorption and desorption. On 70% NiO-Al₂O₃ catalyst, however, two forms of adsorption were indicated by peaks appearing at 175°C and 321°C respectively. Thermo-desorption of oxygen from powdered transition metal oxide catalyst was studied by Halpern and Germain [104]. The spectra showed a small number of well resolved peaks. One, two or three states of binding were found for oxygen, each population of those states changed with preliminary treatment of the metal oxides. The oxides studied were TiO₂, V₂O₅, Cr₂O₃, MnO₂, Fe₂O₃, NiO and ZnO.

IV. PREFERENTIAL ADSORPTION FROM BINARY LIQUID SOLUTIONS

Temperature programmed desorption technique provides the information about the types of active centres present on the oxide surfaces. Useful information about the nature of the active sites, and their specificity for the adsorption can be easily obtained by the study of the adsorption from carefully selected binary solutions.

Kipling [105], Everett [106], Puri *et al* [107-110], Schay and Nagy [111-114], Goodrich [115] and Aveyard [116], Suri and Ramakrishna [117-121] and Sandle *et al* [122] have contributed a lot on this subject.

It is understood that in adsorption studies from binary liquids, the distinction of solute and solvent becomes arbitrary and both the solute and the solvent are considered to be also adsorbed and most probably both of these are adsorbed simultaneously. The adsorption isotherms obtained by plotting the change of concentration against the equilibrium concentration is a composite isotherm which is not a true adsorption isotherm of that component when change of concentration is taken into account. The significance of the composite isotherm is shown by deriving an equation to relate the preferential adsorption from a two- component mixture to the actual adsorption of each component. The derivation is based on the assumption that each component of the liquid mixture may be adsorbed at the interface.

When a weight “m” of a solid is brought into contact with n₀ moles of a liquid mixture, the mole fraction of the liquid, changes by Δx_1^L with respect to component 1. This change in concentration is brought about by the transfer of n₁^S moles of component 1 and n₂^S moles of component 2 onto the surface of unit weight of the solid. At equilibrium the two components consisting of n₁ and n₂ number of moles remain liquid phase and results in mole fraction, x₁^L, with respect to component 1, the initial mole fraction having been x₀. Then by using the mass balance, the equation may be written as:

$$\begin{aligned}
 n_0 &= n_1 + n_2 + n_1^s m + n_2^s m \quad \text{and} \\
 x_0 &= \frac{n_1 + n_1^s m}{n_0}, \\
 x_1^L &= \frac{n_1}{n_1 + n_2} \\
 1 - x_1^L &= \frac{n_2}{n_1 + n_2} \\
 \therefore x_1^L &= (x_0 - x_1^L) \\
 &= \frac{n_1 + n_1^s m}{n_1 + n_2 + n_1^s m + n_2^s m} - \frac{n_1}{n_1 + n_2} \\
 &= \frac{n_1^2 + n_1 n_2 + n_1 n_1^s m + n_2 n_1^s m - n_1^2 - n_1 n_2 - n_1 n_1^s m - n_1 n_2^s m}{(n_1 + n_2)(n_1 + n_2 + n_1^s m + n_2^s m)} \\
 &= \frac{n_2 n_1^s m - n_1 n_2^s m}{(n_1 + n_2) n_0} \\
 &= \frac{n_0 \Delta x_1^L}{m} = n_1^s (1 - x_1^L) - n_2^s x_1^L \\
 \text{or } \frac{n_0 \Delta x_1^L}{m} &= n_1^s x_2^L - n_2^s x_1^L
 \end{aligned}$$

Where x_1^L and x_2^L refer to the fractions of component 1 and 2 respectively. The liquid phase. The function $\frac{n_0 \Delta x_1^L}{m}$ has been plotted as “adsorption” to give composite isotherms which is however, being used most frequently [123]. The plot of Δx_1^L measured experimentally against x_1^L is the isotherm of concentration change for component 1 i.e., the composite isotherm. This isotherm shows which component is preferentially adsorbed. It has been stressed by many workers that the following factors were attribute to the preferential adsorption:

1. The nature and interaction between the molecules of the binary mixtures.
2. The mode of orientation of the adsorbed molecules at the surface.
3. The thickness of the adsorbed layer.
4. The nature of the solid adsorbent surface, the chemical nature of the surface is of prime importance.

The force field is such that preferential adsorption by a solid is appreciably greater than which occurs at other interfaces, but the extent and the sign of the selectivity vary considerably and this is evident when adsorption takes place from a mixture of polar and a relatively non-polar liquid. Alcohol was adsorbed preferentially on silica gel from alcohol and iso- octane [124] and from alcohol and benzene [125-128] mixtures.

In the absence of specific polar groups, the π - electrons of an aromatic system ensure that the aromatic compounds are adsorbed preferentially the corresponding aliphatic compound by polar solids [129-131]. Madan at all [132] have studied the adsorption from benzene and cyclohexane and have shown that the π - electrons cause the preferential adsorption of benzene on the tin oxide surface.

The effect of chemical, geometrical and steric factors was discussed by Zhdanov *et al* [133]. They have studied the benzene- n- hexane system on Linde Molecular Sieve 5A. The interaction between the π - electrons system of the benzene and the ionic lattice of the zeolite is so strong that the n-hexane is completely excluded virtually on the whole range of concentration. Change of temperature and pressures of adsorption from the completely miscible liquids affect the selectivity. The selectivity generally decreases with rise in temperature and with fall in temperature multilayer adsorption is likely to occur as the critical solution temperature is approached. Chopra [134] and Anand [135] have reported the effect of the change of temperature on the change of preference. The effect of pressure on adsorption is of little interest. However, it has been studied by Rosen [136] and shown that the adsorption of acetic acid by charcoal from aqueous solution increased slightly as the external pressure is increased from 1 to 2000 atmospheres. For this, no explanation was put forward.

Kipling [13], Everett [106,137], Schay-Nagy [111-114], Sircar and Myers and Larinov and Myers [138,139] have put forward the various models for the adsorption phenomenon.

It was proved by Winter [140] that surface heterogeneity in most of the oxide adsorbents is due to the surface oxygen present. Metal oxides prepared by precipitation method [25] have surface hydroxyl groups which on heating lose water and leave different metal oxygen groups which make the oxides non- stoichiometric and changed their adsorption behaviour.

Madan [141] performed the binary liquid adsorption tin oxide gel and tin- oxide precipitates. It was reported that both the tin oxide gel and precipitates preferred alcohol from alcohol- hydrocarbon mixtures which was attributed to acidic nature of oxides and the presence of hydroxyl groups on their surfaces. The surface of the tin oxide precipitate had adsorbed layer which was half molecule thick indicating that the surface has been partially covered while the thickness of the adsorbed layer on tin oxide gel was multimolecular in nature. This was attributed to the reason that tin oxide gel surface had hydroxyl groups profusely on its surface while the extent of abundance on tin- oxide precipitate was lesser. It was also shown [142] that powdered solids have cracks, crevices which result in the formation of a large number of edges and corners as compared to the plane surface. The crevices and cracks hold the physically bonded molecules, more energetically, than the plane surfaces. Surfaces are generally rich in impurities thus chemical heterogeneity is introduced and consequently the adsorption behaviour is changed. In the case of homogeneous surfaces, which can adsorb one component strongly, a U-shaped composite isotherm is obtained. S-shaped composite isotherms are obtained in the case of heterogeneous surfaces, which have affinity for the adsorption of both compounds. Thermodynamic properties of the binary liquid mixtures have also been used to predict the preferentially adsorbed component. Komorov and Ermolenko *et al* [143] have inferred that if the solutions show negative deviation from ideality, the component present in excess, is selectively adsorbed; if the solution shows positive deviation the component present in lower concentration is selectively adsorbed. This was attributed to the escaping tendency of the component in the liquid mixture, especially when it is present in small concentrations thus S-type adsorption isotherms were obtained. A number of workers [144,145] have investigated the effect of porosity on the adsorption of binary liquids. It was inferred that higher the porosity, higher the extent of absorption of the liquid. The effect of hydrogen bonding between the solid and the adsorbent or between the two components of the liquid affect the preference of absorption [146-148].

The literature survey clearly indicates that careful study of absorption from binary solution can provide very useful information about the nature of the surface and the surface-active centres.

V. THE MÖSSBAUER EFFECT

R.L. Mössbauer first reported the phenomenon in 1958 [149-151]. By Mössbauer effect, it was found possible to evaluate the electron density at each Mössbauer nucleus, which is related to valency of the atom, and to examine the crystal field produced by the neighbouring atoms. Because of the diversity in the applications of Mössbauer spectroscopy the literature is scattered throughout the journals of different disciplines. The literature coverage in "Mössbauer Effect Data Index" is very useful for workers in this field [152,153]. The literature regarding the interest of catalytic chemists has been summarised in recent reviews [154-165] and several other monographs [166,167].

The ^{119m}Sn Mössbauer spectra of some inorganic compounds and twenty alloys are given by Hayes [168]. The parameters which are of direct chemical interest such as the isomer shift and the quadrupole splitting are discussed.

Goldanskii [169] has reported that in case of SnO_2 a polymeric structure exists in which the oxygen forms a distorted octahedron around the metal atom. Herber and Spijkerman [170] have suggested that the small quadrupole splitting observed in this compound arises from this distortion as well as an additional twinning deformation of the octahedron of oxygen ions that surround the tin ion. Mössbauer spectra of a series of molecular Tin (II) oxides, isolated in solid nitrogen at 5K were measured by Bos *et al* [171] and found that for SnO , the Sn 5s population is only slightly less than 2, and predicted a point on the isomer shift against electron density scale in support of that previously obtained from Sn atoms. Donaldson *et al* [172] have reported 119 Sn Mössbauer spectra of the precipitates, obtained when the pH of mixed Sn(II)-Sn(IV) solution was raised. Fabrichnyi *et al* [173] investigated the phase transition of VO_2 doped with 0.16 atom % Sn^{4+} by Mössbauer spectroscopy of ^{119}Sn and hyperfine magnetic fields were observed on ^{119}Sn nuclei below transition temperature. The tin- 119 Mössbauer studies were extended to iron, manganese and cobalt oxides by Sekizawa *et al* [174]. The tin-119 Mössbauer spectroscopy was also applied to the study of VO_2 , a compound in which phase transition takes place at 340 K by

Fabrichnyi *et al* [175]. The Mössbauer spectrum consisted of a single line with a positive chemical shift with respect to the emission line of BaSnO₃. They assumed that addition of tin, because of substitution by Sn⁴⁺ of V⁴⁺, liberates some V spins which can form antiferromagnetic pairs and magnetically ordered clusters in the structure of low temperature VO₂. The Mössbauer spectrum for 119 Sn⁴⁺ antiferromagnetic Cr₂O₃ was investigated by Miterofanov *et al* [176]. It had same structure as α -Fe₂O₃, but different from it in the lower value of magnetic moment of the cations. The activity of mixed lead oxide PbO₂-MO₂ (M=, Ti, Zr) catalyst in catalytic oxidation of propylene by NO was reported by Plachinda and Blourov [177]. The activity was dependent on the bond energy of the oxidizing agent NO with the catalytic surface. The isomer shifts and the line widths were given for the Mössbauer spectra of the Sn⁴⁺ in Pb-SnO, SnO₂ and Pb-Ti-O (containing 3% SnO₂) catalysts. The ¹¹⁹Sn Mössbauer spectroscopic studies made by Thornton and Harrison [178] confirmed the partial reduction of the Sn (VI) oxide to Sn (II) species when carbonate species were formed over hydroxylated tin oxide when carbon dioxide was adsorbed over it in the range 320- 618 K. Saraswat *et al* [179] made Mössbauer resonance studies to rule out the formation of any form of known oxyhydroxide in ferric oxide hydrate gel. A multicomponent molybdate catalyst was studied by Prasad Rao and Menon [180] using Mössbauer spectroscopy with ⁵⁷Co as a source. After use the valency of iron in Fe₂(MoO₄)₃ and FeMoO₄ reported was +3 and +2 respectively.

Antimony-121 spectra of U-Sb oxides are reported by Birchall and Sleight [181]. The antimony-121 Mössbauer investigations on Sn-Sb were also reported by Suzdalev *et al* [182].

Birchall *et al* [183] investigated the Sn_{1-x}Sb_xO₂ system by Mössbauer spectroscopy by means of ¹¹⁹Sn and ¹²¹Sb. The presence of an unresolved quadrupole splitting was confirmed in SnO₂. The oxidation states of Sn and Sb found were IV and V respectively. It was also reported that as the antimony content increases, the ¹¹⁹Sn isomer shift and electron density at the tin nucleus is also increased, as expected, for a conduction band composed largely of Sn 5S orbitals. Portefaix *et al* [184] investigated mixed oxides of tin and antimony by Mössbauer spectroscopy as a function of function of composition and firing temperature. They found that at low calcination temperatures antimony was present as Sb⁵⁺ dissolved in the SnO₂ lattice at 5 atoms % antimony and a mixture of Sb⁵⁺ and Sb³⁺ at higher concentrations. They also reported that only small variations of the nuclear Gamma ray parameters were observed up to antimony content of 10%. They did not observe any unreduced species. Boudeville *et al* [41] have also reported in the Mössbauer studies performed on their samples that tin underwent no detectable reduction due to charge compensation resulting from antimony (V) incorporation into the tin oxide matrix.

In the light of solid solution study Karasev *et al* [185] investigated SnO₂-MoO₃ system. The absorber was maintained at 78 and 300 K. The isomer shift with respect to SnO₂ at 300 K reported was 0.00 mm/sec. The tin-119 Mössbauer parameters of MoO₃, SnO₂, Cr₂O₃, V₂O₅, NiO with tin oxide were also reported by Karasev *et al* [186].

Skalkina *et al* [187] found that a correlation exists between the Mössbauer parameters, for example, isomer shift and quadrupole splitting vs. catalytic activity of different catalysts, such as Fe (III) and Sn (IV) oxides with the oxides of molybdenum, antimony and chromium for oxidative ammonolysis of propylene. It was concluded that the immediate surrounding of iron or tin ions in the catalysts determine the selectivity of the catalyst in the reaction. The values of quadrupole splitting for SnO₂- MoO₃, SnO₂-Sb₂O₄ and SnO₂- Fe₂O₃ catalysts system reported were 2.04, 1.92 and 2.12 mm/sec respectively. Firsova *et al* [188] in their studies reported that Mössbauer spectroscopy proved that propylene and acrolein form surface compounds during chemisorption Sn-Mo-O films. The compounds are bound to the tin ions via oxygen causing the reduction of originally tin (IV) to tin (II). They reported that since an analogous reduction of tin (IV) is not observed during an adsorption of propylene and acrolein on pure tin oxide, so they presumed that the presence of molybdenum ions was responsible for the observed phenomenon.

Berry and Maddock [189] also reported the tin-119 Mössbauer investigation Sn_{1-x}Sb_xO₂ (x = 0.01- 0.10) system calcined at 600°C. The Mössbauer parameters constantly and steadily departed from those of stannic oxide but provided no localized tin (II).

VI. CATALYTIC OXIDATION STUDIES

Oxidation of methanol over mixed oxides has been a subject of several investigations. A number of workers have tried the air-methanol oxidation to formaldehyde over MoO₃-Fe₂O₃, MoO₃-V₂O₅, MoO₃-Cr₂O₃ based metal oxide combinations and other catalysts [190-203]. Effort has been made to understand the exact route for the oxidation of methanol. The nature of active sites on the Fe₂O₃-MoO₃ catalyst for the methanol oxidation is studied by Jirů *et al* [192]. The effect of water on the catalytic oxidation of methanol to formaldehyde was studied by Pernicone

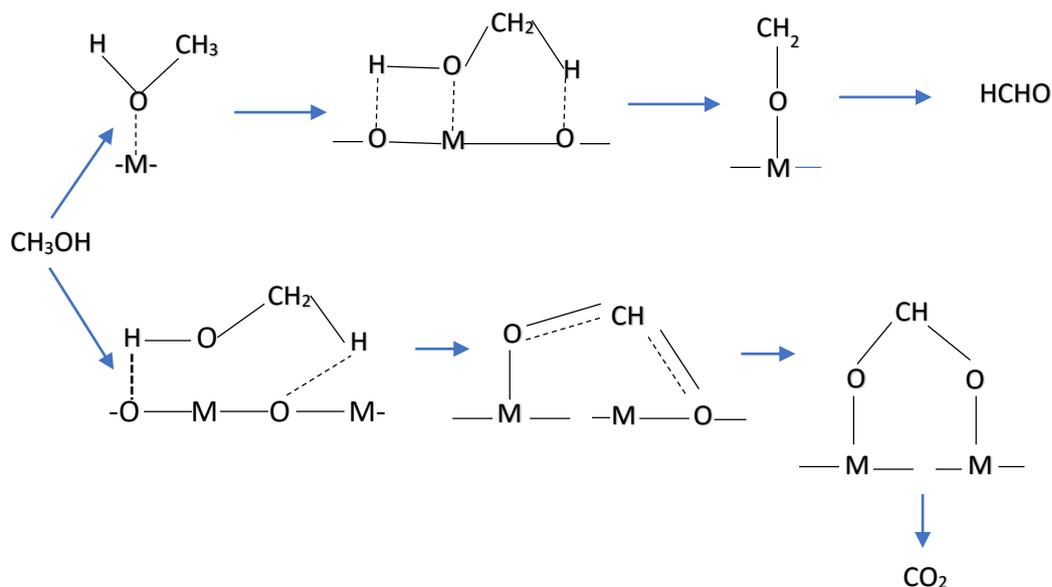
et al [204]. They inferred that water is more basic than methanol and this gets adsorbed over catalyst and inhibits the reaction.

Greco and Soldano [205] and Boreskov *et al* [206] used $\text{Fe}_2(\text{MoO}_4)_3$ with MoO_3 to oxidize methanol to formaldehyde. The nature of the active component in Fe_2O_3 - MoO_3 catalyst was investigated by Trifiro *et al* [207] and concluded that ferric molybdate is the most reactive component. It was proposed that the iron in ferric molybdate seems to act as the transfer agent of oxygen and water between the surface and the gas phase. X-ray structure study of MoO_3 - $\text{Fe}_2(\text{MoO}_4)_3$ catalyst used for or methanol oxidation was made by Fagherazzi and Pernicone [208]. The oxidation of methanol on molybdenum trioxide, with its lattice oxygen only, was investigated by Novakova *et al* [209]. The change of oxidation mechanism due to lowering of the valence of Mo^{6+} to Mo^{4+} was suggested. Oxidation of methanol in gaseous phase and in the presence of oxygen to formaldehyde was studied by Boreskov [210]. Formation of CO was explained as a result of consecutive reaction. No O_2 or H_2 were found in gaseous product which were attributed to the non- existence of dehydrogenation step. The reactivity of lattice oxygen and catalytic activity of MoO_3 as oxidation catalyst were correlated according to the strength of lattice oxygen bond [210-213].

The importance of spinel formation of some mixed oxide catalysts involved in methanol synthesis stressed [214, 215]. The oxidation of methanol on pure Fe_2O_3 at 220°C was compared with the oxidation of methanol on MoO_3 and $\text{Mo}^{6+}\text{Fe}^{3+}\text{O}$ by Novakova *et al* [199]. The mechanism of methanol oxidation to formaldehyde over MoO_3 - $\text{Fe}_2(\text{MoO}_4)_3$ catalyst was investigated kinetically by Pernicone *et al* [198]. Water inhibited the reaction rate. The rate determining step was proposed to be the desorption of the products. Kinetics of the vapour phase oxidation of methyl alcohol on V_2O_5 - MoO_3 catalyst was studied by Mann and Dosi [202] between 250 and 530°C . The maximum yield (more than 90%) of formaldehyde (100% selectivity) was obtained at 466°C containing 8% methanol in the feed and rate expression was deduced. Tarama *et al* [216] studied the structure of the catalyst of V_2O_5 - MoO_3 by X-ray, infrared, ESR and magnetic susceptibility measurements and found that MoO_3 had promotional action on V_2O_5 for oxidation reaction. The investigations of catalytic activities of V_2O_5 - NiO , V_2O_5 - Fe_2O_3 and V_2O_5 - Cr_2O_4 systems in the reactions of methanol oxidation to formaldehyde showed much higher selectivities for mixed oxides than pure oxides [203]. The highest yield for formaldehyde was obtained for catalysts with atomic ratios $\text{V}/\text{Me} = 1$. Infrared spectra were taken of the 1:1 catalyst before and after 2 hours of methanol oxidation at 410°C and showed different stabilities of $\text{V}=\text{O}$ bond. The resulting structure modifications were most significant in the $\text{Me}-\text{O}$ bond region. Bliznakov *et al* [217] studied tungstates of metals of the IV period with regard to their catalytic activity of methanol oxidation to formaldehyde. The highest reactivity was found for ferric tungstates; however, their reactivity was much lower than that of ferric molybdates. Partial oxidation of methanol in iron- molybdenum oxide catalyst was studied by Edwards *et al* [218]. The results suggested that OCH_3 on the surface play an important role in the reaction sequence.

Ai [219-224] studied the following oxides:

MoO_3 - TiO_2 , MoO_3 - Fe_2O_3 , MoO_3 - SnO_2 , MoO_3 - P_2O_5 , MoO_3 - Bi_2O_3 , P_2O_5 , V_2O_5 - MoO_3 , WO_3 and V_2O_5 based oxides, SnO_2 - K_2O_3 , Co_3O_4 - K_2O , Bi_2O_3 - X_nO_m ($\text{X} = \text{P}, \text{Mo}, \text{W}, \text{V}$ and S). An attempt was made to correlate the catalytic activity with the surface activity but no clear relationship is observed. Ai [219] also observed that $\text{Sn}/\text{Mo} = (70/30)$ is highly acidic and, as a result, very active in the oxidation of methanol, but catalyses the formation of formic acid and methyl formate. It was considered that when the acidic property of a catalyst is too high, the formaldehyde product, which is an electron- donating (basic) compound, is activated by the acidic sites and, then oxidized to formic acid. A mechanism as shown below was given by Ai [219] for the oxidation of methanol to formic acid and CO_2 :



Mars and Krevelen [225] have proposed the following reaction mechanism:



Trifiro and Pasquon [194] have studied a number of mixed oxides of tin, antimony and molybdenum. In the oxidation of methanol on $\text{SnO}_2\text{-Sb}_2\text{O}_3$, carbon dioxide was essentially obtained while on MoO_3 at $T < 350^\circ\text{C}$ selectively for formaldehyde was obtained higher than 80% [226-228]. They classified the metal oxides in two groups:

- i. Metal- oxide double bond character ($\text{M}=\text{O}$)
- ii. Metal- oxide single bond character ($-\text{M}-\text{O}-$)

Thus, MoO_3 was placed in category (i) while $\text{SnO}_2\text{-Sb}_2\text{O}_3$ was placed in category (ii). Thus, the catalytic oxidation of methanol over Sn-Sb and Sn-Mo oxides along with pure oxides i.e. SnO_2 , Sb_2O_5 and MoO_3 for the comparison was performed. Thus, the activities were compared with respect to the composition of the oxide catalyst of tin-antimony and tin-molybdenum for the oxidation of methanol.

VII. CONCLUSION

The review shows that the tin- antimony and tin- molybdenum oxides have been widely used as industrial catalysts. The catalytic activity of these oxides has been shown to alter with the variation of the methods of preparation and activation temperature. Scattered attempts have been made on correlating the catalytic activity with the nature of the surface- active centres, but there is no comprehensive work available where different compositions and the surface physio- chemical and catalytic properties investigated.

The surface physico-chemical properties such as surface area, surface excess oxygen, solid state nature, and surface morphology of the different samples have been reported.

It is already mentioned that tin- antimony and tin- molybdenum oxides are very important oxidative dehydrogenation and oxidation catalysts. Not much information is available in the literature on T.P.D. (Temperature Programed Desorption) studies. The T.P.D. studies on Alumina, Nickel Oxide, TiO_2 with reference to active sites and chemisorption are reviewed

It was also seen that the study of the preferential adsorption of the binary liquid mixtures of the non- electrolytes provides useful information regarding the nature of the surface. The preferential adsorption studies of the binary

solutions like methanol + benzene etc. are, the nature and interaction between the molecules of the binary mixtures are reviewed.

The ^{119m}Sn Mössbauer spectra of some inorganic compounds and twenty alloys are given by Hayes [229]. The parameters which are of direct chemical interest such as the isomer shift and the quadrupole splitting are reported and discussed in order to highlight the nature of the active centres present on the surface of both the oxide systems. Goldanskii [230] has reported that in case of SnO_2 a polymeric structure exists in which the oxygen forms a distorted octahedron around the metal atom. In the course of investigations, it was seen that tin was present as Sn^{4+} . No spectra corresponding to Sn^{2+} were obtained. By increasing the concentration of molybdenum S- electron density at the tin- nucleus increased.

Oxidation of methanol over mixed oxides has been a subject of several investigations. Not much information on the oxidation of methanol over mixed and pure oxides of Tin-Antimony are reported but a number of workers have tried the air-methanol oxidation to formaldehyde over $\text{MoO}_3\text{-Fe}_2\text{O}_3$, $\text{MoO}_3\text{-V}_2\text{O}_5$, $\text{MoO}_3\text{-Cr}_2\text{O}_3$ based metal oxide combinations and other catalysts. The other studies indicated that ferric molybdate is the most reactive component in $\text{Fe}_2\text{O}_3\text{-MO}_3$ catalyst. The review indicated that the iron in ferric molybdate seems to act as the transfer agent of oxygen and water between the surface and the gas phase. Similar studies are also reported on other catalysts made of mixed and pure forms of metal oxides.

ACKNOWLEDGEMENT

The authors are thankful to the Indian Institute of Technology, Delhi (I.I.T. Delhi) for providing the facilities for conducting the studies.

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Development of minerals profile including heavy metals of selected rice varieties (*Oryza sativa L.*) consumed in Sri Lanka.

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DOI: 10.29322/IJSRP.10.09.2020.p10590

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10590>

Abstract - Rice is the staple food of most Asian countries with fulfilling the daily nutritional requirements of humans. Therefore, this study was conducted to investigate the levels of concentration of 23 macro and micro elements in 30 selected rice varieties in Sri Lanka for development of minerals profiles including heavy metals. In general, the mean concentration pattern of elements in rice samples was decreased as, P > K > Mg > Ca > Zn > Mn > Fe > Na > B > Al > Cu > Ba > Mo > Cr > Co > Ni > Hg > As. The mean concentration of Sb, Be, Se, Cd, and Pb in rice were lower than the limit of quantification which was 0.05 mg/kg for each element. Mean concentration of Hg in Suduheenati was same as the maximum permissible limit given by WHO/ FAO guideline. Moreover, the results of the present study revealed traditional and pigmented rice varieties in Sri Lanka to be a potential source of valuable minerals together with balanced level of other nutrients than branded and non-pigmented rice varieties.

Keywords - rice varieties, minerals, microwave digestion, inductively coupled plasma–mass spectrometry

I. INTRODUCTION

Rice (*Oryza sativa L.*) is the most important cereal and the backbone of Sri Lankan agriculture since antiquity. Rice grains are a rich source of carbohydrate, fiber, protein, fats, oils, minerals and vitamins[1]. Among all nutritional attributes, minerals play a major role for human growth and development. Minerals can be found in adequate amounts in rice[2]. Even though, in present, rice may contain toxic elements including heavy metals or it may encompass essential elements which can be present more than recommended daily intake for human beings. This happens due to various anthropogenic activities including industrial processes, use of pesticides, chemical fertilizers and atmospheric decomposition. Excessive levels of macro and micro elements can be hazardous to human health and they may cause acute and chronic poisoning. Mainly, heavy metals are potential contaminants which can be accumulated through the food chains and they have a capability to produce different types of detrimental effects on human health[3]. Therefore,

this study was conducted to analyze the composition of macro and micro elements of 10 traditional rice varieties and 20 branded and imported rice varieties which were available in Sri Lanka. For the investigation of mineral levels in rice samples, laboratory validated, reliable analytical approaches were used with sufficient accuracy and precision using inductively coupled plasma – mass spectrometer (ICP- MS) and ultra violet - visible spectrophotometer.

According to the past studies, different analytical techniques including dry ashing, atomic absorption spectrophotometer (AAS)/ inductively coupled plasma optical emission spectrometer (ICP-OES), microwave digestion, AAS/ inductively coupled plasma mass spectrometer (ICP-MS), microwave digestion/ graphite furnace atomic spectrometer and instrumental neutron activation with k0 standardization were used only for determination of the content of several selected toxic elements in rice[4],[5]. But, when using ICP-MS, it can provide the information about the ratio of elemental isotopes, it has large linear dynamic range, and elements can be analyzed with a good precision within a short time (about 1– 2minutes) with lower detection limits[6]. All rice samples were digested in a closed- vessel microwave digester which is a determinative technique for complete digestion within a shorter time while preventing loss or contamination of the target analytes[7].

II. MATERIALS AND METHODS

2.1 Materials and instruments: For determination of metals, ≥ 69% m/v ultra-pure nitric acid (HNO₃, Merck- Darmstadt, Germany) was used for microwave digestion. 100 µg/L Instrument tuning solution and 100 µg/L internal standard solution were prepared by diluting ICP-MS stock tuning solution and 10 µg/mL internal standard solution (Agilent technologies, USA). Calibration standard solutions were prepared using 10 µg/mL multi- element calibration standard 2A, 3 and 4 (Agilent technologies, USA). Rice samples were spiked using 1000 mg/L certified reference materials (CRMs – containing Al, Ba, Be, Ca, Mg, Na, K, Sb and B, Sigma – Aldrich, Switzerland). For determination of phosphorous, 99% m/m potassium dihydrogen orthophosphate (BDH

laboratory reagents, India) was used to prepare 1000 mg/L phosphate stock solution. 99% m/m Ammonium-metavanadate (Riedel-dehaen) and 99% m/m ammonium heptamolybdatetetrahydrate (Merck, Germany) were used for the colorimetric reaction. 69.0-72.0% m/v HNO₃ (Research – Lab Fine Chem, Mumbai) and 37% m/v HCl (ARISTAR, VMR) were used for acid digestion of the samples.

All determinations of metals were carried out by inductively coupled plasma – mass spectrometer (ICP- MS Agilent 7900, Japan). Phosphorous content in rice samples were determined by using UV- visible spectrophotometer (UV-1800, Shimadzu, Japan). Samples were digested using a microwave digester (CEM MARS Xpress, model 240/50, United States). Analytical balance (DENVER TP 214, United States) was used to weigh the samples with an accuracy of 0.0001 g.

2.2 Analysis of mineral composition of rice: 30 rice samples were randomly selected from a local market in Sri Lanka for the analysis. For determination of metals, rice samples (about 0.5000 g) were digested in the microwave digester at 180 °C for 30 minutes using 10.0 mL of ultrapure HNO₃. The digested solution was transferred to a 25.0 mL volumetric flask. Metal content of the samples were determined by ICP- MS. Details of the instrumental settings are given in Table 1. For determination of phosphorous, the rice sample (about 2.0000 g) was ashed at 480 °C for 6 hours. 100.0 mL of distilled water was added and it was boiled. 10.0 mL of conc. HCl and 10.0 mL of conc. HNO₃ were added to the boiling solution. The solution was transferred to a 100.0 mL volumetric flask. Vanadomolybdate reagent was added and, absorbance was measured at 420 nm using cell with a 1cm path length.

2.3 Statistical analysis and graphical presentation: All data were analyzed using Microsoft Excel (version 2013) and Minitab software (version 16) respectively. The data were subjected for analysis of variance at 95 % confidence level (ANOVA, p < 0.05) with excel and principal component analysis was carried out in order to determine relationships between traditional and branded rice varieties as well as pigmented and non- pigmented rice varieties.

Table 1: ICP – MS operating conditions

Operating conditions	
Nebulizer	Meinhard concentric 400 μL/min
Spray chamber	Scott- type double- pass water cooled
Cell geometry	Octoploe
Sampling cone	Nickel, 1.0 mm orifice
Skimmer cone	Nickel, 0.2 mm orifice
RF power	1500 W
Reflected power	< 15 W
Standard mode	
Plasma gas flow	15.0 L min ⁻¹
Nebulizer gas flow	1.05 L min ⁻¹
Auxiliary gas flow	0.90 L min ⁻¹
He mode	
He gas flow	5.0 L min ⁻¹
Octopole bias	-18 V
Quadrapole bias	-13 V

III RESULTS AND DISCUSSION

Concentrations of selected macro and micro elements of thirty rice samples were given in the table 2. Reliable and accurate data were generated using the validated test methods. Recovery percentages for each element were within the range from 78.5 % to 108 %. According to the results of the study, P, K and Mg were available in higher amounts compared to other elements considered during analysis of selected rice varieties. Phosphorous (P) was the most abundant element found in all rice varieties, which ranged from 0.130±0.015 % to 0.630± 0.075 %. Basmathi contained the lowest P level while Dikwee comprised the highest amount of P. Godaheenati contained the highest K and Mg levels which were 0.430± 0.021 % and 0.108± 0.007 % respectively. Madathawalu contained the lowest K level which was 0.073± 0.004 % and Basmathi contained the lowest Mg level which was 0.014± 0.001 %. All the traditional rice varieties contained Na in considerable levels. The lowest Na level of 2.52± 0.15 mg/kg was found in Keeri samba 2 while the highest Na level of 5.95± 0.36 mg/kg was found in Godaheenati. The highest Ca level found was 192.90± 11.57 mg/kg in Red Samba and the lowest of 108.31± 6.50 mg/kg was found in Nadu 4.

The highest B level detected was 7.90± 0.76 mg/kg in Nadu 4 and the lowest B level detected was 0.40± 0.04 mg/kg in Pachchaperumal. Madathawalu contained the highest Al level which was 4.10± 0.36 mg/kg. Zn, Mn and Fe were the micro elements present at the highest levels in selected rice samples. The lowest Zn level of 11.60± 0.56 mg/kg was found in red raw rice while the highest level of 46.30± 2.22 mg/kg was found in Rathuheenati.

Table 2: Variation of physical properties of selected rice varieties in Sri Lanka.

Rice Variety	Traditional/ Improved	Crop duration	Colour of the pericarp	Appearance		Raw/ Parboiled
				Length/ mm	Width/ mm	
Dikwee	Traditional	4.5 months	red	5.51 ± 0.02	1.74 ± 0.01	Raw
Godaheenati	Traditional	3.5 months	red	5.16 ± 0.01	1.98 ± 0.01	Raw
Rathuheenati	Traditional	4 months	red	3.76 ± 0.04	1.96 ± 0.01	Raw
Suduheenati	Traditional	4 months	red	5.98 ± 0.01	2.14 ± 0.01	Raw
Pachchaperumal	Traditional	3 months	red	5.22 ± 0.01	2.34 ± 0.01	Raw
Suwandel	Traditional	3 months	White	3.69 ± 0.04	1.80 ± 0.02	Raw
Masuran	Traditional	4.5 months	red	3.89 ± 0.04	2.27 ± 0.01	Raw
Herathbanda	Traditional	3.5 months	red	5.47 ± 0.01	2.27 ± 0.01	Raw
Madathawalu	Traditional	3.5 months	red	5.62 ± 0.01	2.26 ± 0.01	Raw
Sulai	Traditional	3.5 months	red	5.31 ± 0.01	2.29 ± 0.01	Raw
Red raw rice	Improved	3.5 months	red	6.20 ± 0.02	1.90 ± 0.01	Raw
Tempered red samba	Improved	3.5 months	red	3.97 ± 0.03	1.94 ± 0.01	Parboiled
Red nadu	Improved	3.5 months	red	5.18 ± 0.01	2.10 ± 0.01	Parboiled
Red samba	Improved	3.5 months	red	3.84 ± 0.03	1.98 ± 0.05	Parboiled
Rathukekulu	Improved	3.5 months	red	6.22 ± 0.02	1.88 ± 0.01	Raw
Basmathi	Improved	5 months	White	6.42 ± 0.03	1.70 ± 0.01	Parboiled
White raw rice	Improved	3.5 months	White	5.00 ± 0.01	2.20 ± 0.02	Raw
White samba raw	Improved	4 months	White	3.69 ± 0.04	1.95 ± 0.05	Raw
Nadu 1	Improved	3 months	White	5.30 ± 0.01	2.31 ± 0.01	Parboiled
Nadu 2	Improved	3 months	White	5.20 ± 0.01	2.24 ± 0.01	Parboiled
Nadu 3	Improved	3 months	White	5.30 ± 0.01	1.90 ± 0.01	Parboiled
Nadu 4	Improved	3 months	White	5.10 ± 0.01	2.10 ± 0.01	Parboiled
Nadu 5	Improved	3 months	White	5.28 ± 0.01	2.18 ± 0.01	Parboiled
Samba 1	Improved	3.5 months	White	3.88 ± 0.03	2.01 ± 0.05	Parboiled
Samba 2	Improved	3.5 months	White	4.00 ± 0.03	1.90 ± 0.05	Parboiled
Samba 3	Improved	3.5 months	White	3.97 ± 0.01	2.06 ± 0.05	Parboiled
Samba 4	Improved	3.5 months	White	3.88 ± 0.03	2.00 ± 0.05	Parboiled
Samba 5	Improved	3.5 months	White	3.78 ± 0.03	1.93 ± 0.05	Parboiled
Keeri samba 1	Improved	3.5 months	White	4.04 ± 0.20	1.70 ± 0.01	Parboiled
Keeri samba 2	Improved	3.5 months	White	4.02 ± 0.20	1.70 ± 0.01	Parboiled

The concentration range for Mn was from 2.10± 0.10 to 39.60± 1.78 mg/kg. The highest Mn content was found in Rathuheenati while the lowest Mn content was found in Keeri samba 2. The concentration range for Fe of selected rice samples was from 0.70± 0.02 to 29.40± 1.76 mg/kg. Rathuheenati contained the highest concentration of Fe while

Nadu 1 contained the lowest concentration of Fe. Cu and Mo content of rice varieties did not elicit a great variation except Dikwee, Godaheenati and Masuran. Godaheenati, Rathuheenati, Pachchaperumal and Suwandel contained As in a considerable level of concentration which did not exceed the maximum permissible limit in rice which is 0.2 mg/kg

Table 3: Concentrations of selected elements in analyzed rice samples.

Name of the variety	P(As P ₂ O ₅) (%)	K (%)	Mg (%)	Na (mg/kg)	Ca (mg/kg)	B (mg/kg)	Al (mg/kg)	Sb (mg/kg)	Be (mg/kg)	Ba (mg/kg)
Dikwee	0.630±0.075	0.288±0.014	0.072±0.004	4.93±0.30	116.21±6.97	1.50±0.14	2.70±0.24	N. D. <0.05	N. D. <0.05	0.40±0.04
Goda heenati	0.580±0.069	0.430±0.021	0.108±0.007	5.95±0.36	154.16±9.25	4.60±0.44	1.30±0.11	N. D. <0.05	N. D. <0.05	0.70±0.06
Rathu heenati	0.388±0.046	0.270±0.013	0.066±0.004	5.50±0.33	129.65±7.78	5.50±0.53	0.30±0.03	N. D. <0.05	N. D. <0.05	0.30±0.03
Sudu heenati	0.416±0.050	0.248±0.012	0.056±0.003	5.58±0.33	150.21±9.01	4.20±0.40	2.30±0.20	N. D. <0.05	N. D. <0.05	1.80±0.16
Pachcha-perumal	0.430±0.051	0.292±0.014	0.069±0.004	5.05±0.30	125.70±7.54	0.40±0.04	1.50±0.13	N. D. <0.05	N. D. <0.05	0.20±0.02
Suwandel	0.191±0.023	0.114±0.005	0.014±0.001	4.67±0.28	148.62±8.92	5.00±0.48	N. D. <0.5	N. D. <0.05	N. D. <0.05	0.60±0.05
Masuran	0.380±0.045	0.215±0.010	0.060±0.004	3.94±0.24	154.16±9.25	4.57±0.44	1.28±0.11	N. D. <0.05	N. D. <0.05	0.67±0.06
Herath banda	0.420±0.050	0.124±0.006	0.037±0.002	4.05±0.24	150.21±9.01	2.64±0.25	2.96±0.26	N. D. <0.05	N. D. <0.05	1.78±0.16
Mada-thawalu	0.640±0.076	0.073±0.004	0.043±0.003	3.92±0.24	144.67±8.68	6.11±0.59	4.10±0.36	N. D. <0.05	N. D. <0.05	0.36±0.03
Sulai	0.420±0.050	0.087±0.004	0.041±0.003	2.56±0.15	169.97±10.20	5.60±0.54	3.75±0.33	N. D. <0.05	N. D. <0.05	1.36±0.12
Red raw rice	0.295±0.035	0.146±0.007	0.033±0.002	4.11±0.25	144.67±8.68	7.60±0.73	1.80±0.16	N. D. <0.05	N. D. <0.05	0.30±0.03
Tempered Red samba	0.356±0.042	0.156±0.007	0.039±0.002	4.09±0.25	169.97±10.20	6.90±0.66	0.60±0.05	N. D. <0.05	N. D. <0.05	1.30±0.11
Red Nadu	0.374±0.045	0.168±0.008	0.037±0.002	3.90±0.23	146.25±8.78	4.30±0.41	3.70±0.33	N. D. <0.05	N. D. <0.05	0.50±0.04
Red samba	0.422±0.050	0.160±0.008	0.041±0.003	5.92±0.42	192.90±11.57	3.80±0.36	N. D. <0.5	N. D. <0.05	N. D. <0.05	0.40±0.04
Rathu kekulu	0.460±0.055	0.180±0.009	0.044±0.003	4.84±0.29	157.32±9.44	7.40±0.71	N. D. <0.5	N. D. <0.05	N. D. <0.05	0.80±0.07
Basmathi	0.133±0.016	0.086±0.004	0.009±0.001	5.23±0.31	181.83±10.91	6.90±0.66	N. D. <0.5	N. D. <0.05	N. D. <0.05	0.05±0.00
White raw rice	0.187±0.022	0.128±0.006	0.018±0.001	3.12±0.19	134.39±8.06	4.60±0.44	1.00±0.09	N. D. <0.05	N. D. <0.05	0.40±0.04
White samba raw	0.227±0.027	0.116±0.006	0.016±0.001	3.21±0.19	176.29±10.58	2.10±0.20	N. D. <0.5	N. D. <0.05	N. D. <0.05	0.20±0.02
Nadu 1	0.168±0.020	0.186±0.009	0.011±0.001	4.60±0.28	152.58±9.15	4.90±0.47	0.70±0.06	N. D. <0.05	N. D. <0.05	0.30±0.03
Nadu 2	0.249±0.030	0.182±0.009	0.025±0.002	4.16±0.25	171.55±10.29	5.60±0.54	1.40±0.12	N. D. <0.05	N. D. <0.05	0.30±0.03
Nadu 3	0.183±0.022	0.180±0.009	0.010±0.001	3.33±0.20	114.63±6.88	7.50±0.72	0.80±0.07	N. D. <0.05	N. D. <0.05	0.30±0.03
Nadu 4	0.130±0.015	0.172±0.008	0.009±0.001	3.58±0.21	108.31±6.50	7.90±0.76	N. D. <0.5	N. D. <0.05	N. D. <0.05	0.20±0.02
Nadu 5	0.215±0.026	0.180±0.009	0.011±0.001	3.05±0.18	119.37±7.16	1.40±0.13	N. D. <0.05	N. D. <0.05	N. D. <0.05	0.40±0.04
Samba 1	0.152±0.018	0.132±0.006	0.010±0.001	4.17±0.25	146.25±8.78	5.20±0.50	N. D. <0.5	N. D. <0.05	N. D. <0.05	0.30±0.03
Samba 2	0.157±0.019	0.176±0.008	0.011±0.001	3.32±0.20	135.19±8.11	7.10±0.68	0.80±0.07	N. D. <0.05	N. D. <0.05	0.30±0.03
Samba 3	0.187±0.022	0.150±0.007	0.009±0.001	3.00±0.18	141.51±8.49	5.70±0.55	N. D. <0.5	N. D. <0.05	N. D. <0.05	0.30±0.03
Samba 4	0.185±0.022	0.162±0.008	0.012±0.001	2.71±0.16	130.44±7.83	2.20±0.21	N. D. <0.5	N. D. <0.05	N. D. <0.05	0.30±0.03
Samba 5	0.180±0.021	0.186±0.009	0.012±0.001	2.59±0.16	119.37±7.16	5.50±0.53	N. D. <0.5	N. D. <0.05	N. D. <0.05	0.40±0.04
Keeri samba 1	0.232±0.028	0.214±0.010	0.013±0.001	3.32±0.20	188.15±11.29	5.50±0.53	N. D. <0.5	N. D. <0.05	N. D. <0.05	0.60±0.05
Keeri samba 2	0.256±0.030	0.132±0.006	0.020±0.001	2.52±0.15	140.72±8.44	4.90±0.47	N. D. <0.5	N. D. <0.05	N. D. <0.05	0.50±0.04

Name of the variety	Cr (mg/kg)	Mn (mg/kg)	Fe (mg/kg)	Co (mg/kg)	Ni (mg/kg)	Cu (mg/kg)	Zn (mg/kg)	As (mg/kg)	Se (mg/kg)	Mo (mg/kg)	Cd (mg/kg)	Hg (mg/kg)	Pb (mg/kg)
Dikwee	N. D. <0.05	27.10 ± 1.22	26.00 ± 1.56	N. D. <0.05	N. D. <0.05	0.40± 0.01	34.40± 1.65	N. D. <0.05	N. D. <0.05	0.100± 0.003	N. D. <0.05	N. D. <0.05	N. D. <0.05
Goda heenati	N. D. <0.05	31.40 ± 1.41	28.80 ± 1.73	N. D. <0.05	N. D. <0.05	0.40± 0.01	32.10± 1.54	0.100± 0.003	N. D. <0.05	N. D. <0.05	N. D. <0.05	N. D. <0.05	N. D. <0.05
Rathu heenati	N. D. <0.05	39.60 ± 1.78	29.40 ± 1.76	N. D. <0.05	N. D. <0.05	1.00± 0.03	46.30± 2.22	0.100± 0.003	N. D. <0.05	0.200± 0.006	N. D. <0.05	N. D. <0.05	N. D. <0.05
Sudu heenati	N. D. <0.05	36.90 ± 1.66	26.30 ± 1.58	N. D. <0.05	N. D. <0.05	1.20± 0.03	30.00± 1.44	N. D. <0.05	N. D. <0.05	0.400± 0.012	N. D. <0.05	0.100± 0.003	N. D. <0.05
Pachcha-perumal	N. D. <0.05	31.20 ± 1.4	27.70 ± 1.66	N. D. <0.05	N. D. <0.05	0.90± 0.02	32.50± 1.56	0.100± 0.003	N. D. <0.05	0.200± 0.006	N. D. <0.05	N. D. <0.05	N. D. <0.05
Suwandel	0.200± 0.008	26.30 ± 1.18	22.40 ± 1.34	N. D. <0.05	N. D. <0.05	1.20± 0.03	35.10± 1.68	0.100± 0.003	N. D. <0.05	0.300± 0.009	N. D. <0.05	N. D. <0.05	N. D. <0.05
Masuran	N. D. <0.05	31.43 ± 1.41	28.75 ± 1.73	N. D. <0.05	N. D. <0.05	0.36± 0.01	24.14± 1.16	N. D. <0.05	N. D. <0.05	N. D. <0.05	N. D. <0.05	N. D. <0.05	N. D. <0.05
Herath banda	N. D. <0.05	35.56 ± 1.6	28.89 ± 1.73	N. D. <0.05	N. D. <0.05	1.74± 0.02	31.30± 1.5	N. D. <0.05	N. D. <0.05	0.386± 0.008	N. D. <0.05	N. D. <0.05	N. D. <0.05
Mada-thawalu	N. D. <0.05	27.17 ± 1.22	26.82 ± 1.61	N. D. <0.05	N. D. <0.05	2.04± 0.03	33.30± 1.6	N. D. <0.05	N. D. <0.05	0.351± 0.007	N. D. <0.05	N. D. <0.05	N. D. <0.05
Sulai	N. D. <0.05	30.88 ± 1.39	28.24 ± 1.69	0.100± 0.003	0.098± 0.003	1.94± 0.03	29.46± 1.41	N. D. <0.05	N. D. <0.05	0.325± 0.007	N. D. <0.05	N. D. <0.05	N. D. <0.05
Red raw rice	N. D. <0.05	7.60 ± 0.37	4.00 ± 0.12	N. D. <0.05	N. D. <0.05	1.50± 0.04	11.60± 0.56	N. D. <0.05	N. D. <0.05	0.400± 0.012	N. D. <0.05	N. D. <0.05	N. D. <0.05
Tempered Red samba	0.090± 0.004	10.90 ± 0.53	5.20 ± 0.16	0.100± 0.004	0.100± 0.004	1.30± 0.03	14.20± 0.68	N. D. <0.05	N. D. <0.05	0.300± 0.009	N. D. <0.05	N. D. <0.05	N. D. <0.05
Red Nadu	N. D. <0.05	9.70 ± 0.48	2.50 ± 0.08	N. D. <0.05	N. D. <0.05	1.30± 0.03	14.10± 0.68	N. D. <0.05	N. D. <0.05	0.300± 0.009	N. D. <0.05	N. D. <0.05	N. D. <0.05
Red samba	N. D. <0.05	17.30 ± 0.78	5.50 ± 0.17	N. D. <0.05	N. D. <0.05	2.00± 0.05	19.00± 0.91	N. D. <0.05	N. D. <0.05	0.400± 0.012	N. D. <0.05	N. D. <0.05	N. D. <0.05
Rathu kekulu	N. D. <0.05	12.20 ± 0.55	3.20 ± 0.10	0.100± 0.004	0.100± 0.004	1.60± 0.04	16.00± 0.77	N. D. <0.05	N. D. <0.05	0.500± 0.015	N. D. <0.05	N. D. <0.05	N. D. <0.05
Basmati	0.200± 0.008	3.10 ± 0.15	4.40± 0.13	N. D. <0.05	N. D. <0.05	1.40± 0.04	13.50± 0.65	N. D. <0.05	N. D. <0.05	0.400± 0.012	N. D. <0.05	N. D. <0.05	N. D. <0.05
White Raw rice	N. D. <0.05	7.50 ± 0.37	2.20 ± 0.07	N. D. <0.05	N. D. <0.05	1.50± 0.04	14.90± 0.72	N. D. <0.05	N. D. <0.05	0.300± 0.009	N. D. <0.05	N. D. <0.05	N. D. <0.05
White samba raw	N. D. <0.05	8.10 ± 0.40	1.30 ± 0.04	N. D. <0.05	N. D. <0.05	1.50± 0.04	14.70± 0.71	N. D. <0.05	N. D. <0.05	0.400± 0.012	N. D. <0.05	N. D. <0.05	N. D. <0.05
Nadu 1	N. D. <0.05	3.00 ± 0.15	0.70 ± 0.02	N. D. <0.05	N. D. <0.05	1.30± 0.03	12.50± 0.6	N. D. <0.05	N. D. <0.05	0.300± 0.009	N. D. <0.05	N. D. <0.05	N. D. <0.05
Nadu 2	N. D. <0.05	5.60 ± 0.27	2.50 ± 0.08	N. D. <0.05	N. D. <0.05	1.60± 0.04	13.30± 0.64	N. D. <0.05	N. D. <0.05	0.300± 0.009	N. D. <0.05	N. D. <0.05	N. D. <0.05
Nadu 3	N. D. <0.05	3.00 ± 0.15	1.20 ± 0.04	N. D. <0.05	N. D. <0.05	1.30± 0.03	12.50± 0.6	N. D. <0.05	N. D. <0.05	0.300± 0.009	N. D. <0.05	N. D. <0.05	N. D. <0.05
Nadu 4	N. D. <0.05	2.90 ± 0.14	1.50 ± 0.05	N. D. <0.05	N. D. <0.05	1.60± 0.04	12.70± 0.61	N. D. <0.05	N. D. <0.05	0.400± 0.012	N. D. <0.05	N. D. <0.05	N. D. <0.05
Nadu 5	N. D. <0.05	4.10 ± 0.02	1.40 ± 0.04	N. D. <0.05	N. D. <0.05	1.30± 0.03	13.10± 0.63	N. D. <0.05	N. D. <0.05	0.400± 0.012	N. D. <0.05	N. D. <0.05	N. D. <0.05
Samba 1	N. D. <0.05	2.90 ± 0.14	1.50 ± 0.05	N. D. <0.05	N. D. <0.05	1.60± 0.04	12.20± 0.59	N. D. <0.05	N. D. <0.05	0.300± 0.009	N. D. <0.05	N. D. <0.05	N. D. <0.05
Samba 2	N. D. <0.05	3.10 ± 0.15	0.90 ± 0.03	N. D. <0.05	N. D. <0.05	1.00± 0.03	12.70± 0.61	N. D. <0.05	N. D. <0.05	0.400± 0.012	N. D. <0.05	N. D. <0.05	N. D. <0.05
Samba 3	N. D. <0.05	2.60 ± 0.13	1.40 ± 0.04	N. D. <0.05	N. D. <0.05	1.00± 0.03	12.40± 0.6	N. D. <0.05	N. D. <0.05	0.300± 0.009	N. D. <0.05	N. D. <0.05	N. D. <0.05
Samba 4	N. D. <0.05	3.90 ± 0.19	2.20 ± 0.07	N. D. <0.05	N. D. <0.05	1.50± 0.04	12.90± 0.62	N. D. <0.05	N. D. <0.05	0.300± 0.009	N. D. <0.05	N. D. <0.05	N. D. <0.05
Samba 5	N. D. <0.05	4.40 ± 0.22	0.90 ± 0.03	N. D. <0.05	N. D. <0.05	1.20± 0.03	14.40± 0.69	N. D. <0.05	N. D. <0.05	0.400± 0.012	N. D. <0.05	N. D. <0.05	N. D. <0.05
Keeri samba 1	N. D. <0.05	4.70 ± 0.23	1.00 ± 0.03	N. D. <0.05	N. D. <0.05	1.40± 0.04	13.00± 0.62	N. D. <0.05	N. D. <0.05	0.300± 0.009	N. D. <0.05	N. D. <0.05	N. D. <0.05
Keeri samba 2	N. D. <0.05	2.10 ± 0.10	1.20 ± 0.04	N. D. <0.05	N. D. <0.05	1.70± 0.04	16.20± 0.78	N. D. <0.05	N. D. <0.05	0.500± 0.015	N. D. <0.05	N. D. <0.05	N. D. <0.05

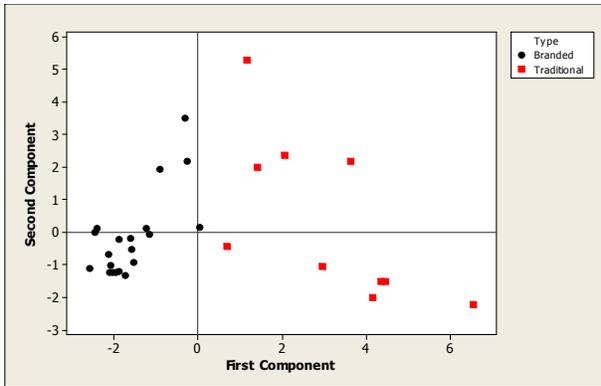


Figure 1. Score plot for the principle compound analysis of mineral composition of traditional and branded rice samples.

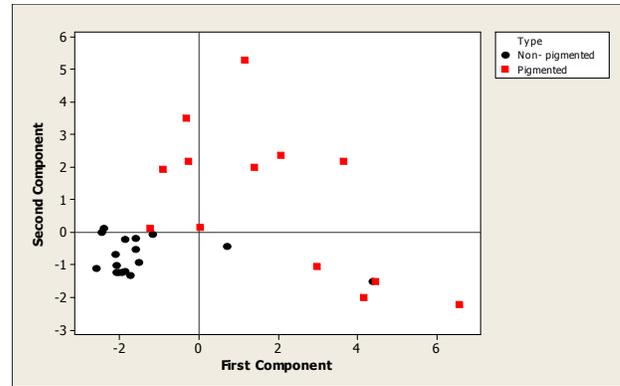


Figure 3. Score plot for the principle compound analysis of mineral composition of pigmented and non-pigmented rice samples.

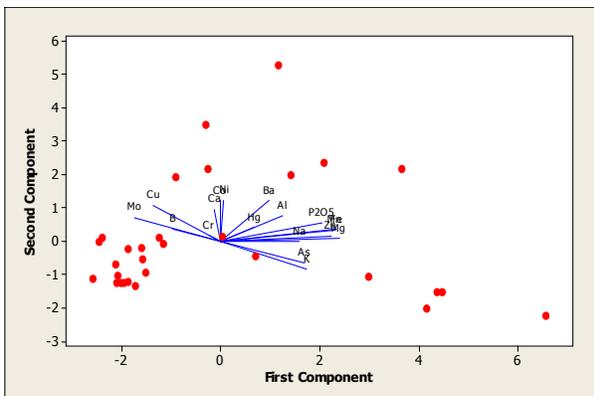


Figure 2. Biplot for the principle compound analysis of mineral composition of traditional and branded rice samples.

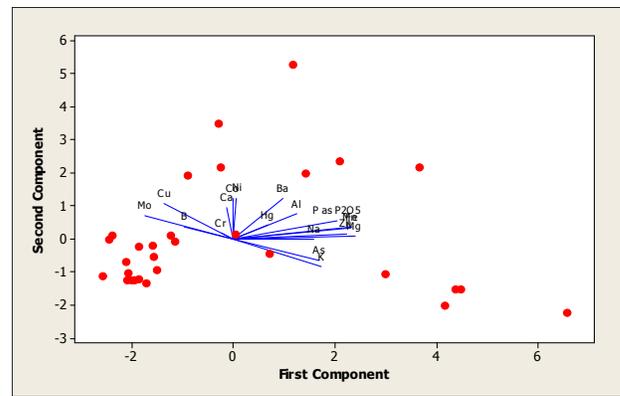


Figure 4. Biplot for the principle compound analysis of mineral composition of pigmented and non-pigmented rice samples.

given by WHO/ FAO guideline of As in rice[8]. The maximum concentration of Hg of analyzed rice samples was same to the maximum permissible limit in rice given by WHO/ FAO guideline of Hg in rice which was 0.1 mg/ kg. Concentrations of Be, Sb, Cd, Se and Pb were lower than the limit of quantification (LoQ) of the test method which was 0.05 mg/ kg for each element.

Significant differences ($p < 0.05$) were observed in the content of P as P_2O_5 , Na, Mg, Ba, Mn, Fe, Zn of traditional and branded rice varieties. There were no any significant differences ($p < 0.05$) the content of K, Ca, B and Cu of traditional and branded rice varieties. As the same way, there were significant differences ($p < 0.05$) between the content of P as P_2O_5 , Na, Mg, Ba, Mn, Fe and Zn of pigmented and non-pigmented varieties. There were no any significant differences ($p < 0.05$) the content of K, Ca, B and Cu of pigmented and non-pigmented rice varieties. In the figures 1 and 2, it is noted that the most of the traditional rice varieties and minerals are mapped on the area with positive loading in the first component (PC1). In other words, traditional rice varieties are associated with higher mineral concentrations

than the branded rice varieties. In the figures 3 and 4, it is noted that the most of the pigmented rice varieties and minerals are mapped on the area with positive loading in the first component (PC1). In other words, pigmented rice varieties are associated with higher mineral concentrations than the non-pigmented rice varieties.

The levels of micronutrients in rice including Fe, Mn and Zn can be decreased due to usage of different steps in the post production of rice such as milling or polishing, and parboiling[9]. Fe, Mn and Zn are localized in different parts of rice grains being concentrated in the aleurone, embryo and endosperm. With the removal of aleurone and embryo during milling or polishing process, Fe, Mn and Zn contents in rice grains are reduced [10]. Fe and Zn deficiencies are the most common micronutrient deficiencies in humans around the world. Rice is used as the main staple food in the most of Asian countries, improving iron and zinc content and bioavailability in rice grains is the most effective way to solve this problem. As reported data in United States Department of Agriculture (USDA), white, long-grain, raw rice contains

8 mg/kg of Fe. Through bio-fortification including conventional breeding or genetic engineering, International Rice research Institute (IRRI) developed rice lines with an average iron content ranging from 12 – 15 mg/kg in the milled rice grains and 40 – 45 mg/ kg of Zn.

According to this study, concentrations of iron in Sri Lankan traditional rice varieties were in high levels which were more than two times richer when comparing with the rice lines developed by IRRI. Therefore, without performing the bio-fortification, Sri Lankan traditional rice varieties can be used as a rich iron source to fulfill the daily nutritional requirement of iron. These traditional rice varieties may also be used as a good source for bio-fortification or genetic engineering to increase the grain iron level to minimize iron deficiency.

There are several reasons for increased iron levels in rice grains. They may be usage of inorganic fertilizers in high levels, accumulation of iron in rice grains due to long growing period (long – duration varieties) before harvesting or naturally these varieties can absorb and utilize a high amount of iron under acidic or saline soil conditions.

IV CONCLUSIONS

The mean concentration pattern of elements in studied rice samples was decreased as, P > K > Mg > Ca > Zn > Mn > Fe > Na > B > Al > Cu > Ba > Mo > Cr > Co > Ni > Hg > As. The mean concentration of Sb, Be, Se, Cd, and Pb in rice samples were lower than the limit of quantification which was 0.05 mg/kg for each element. Traditional rice varieties were richer in minerals including P as P₂O₅, Na, Mg, Ba, Mn, Fe and Zn than branded rice varieties. Therefore, traditional rice varieties are good sources of most of the daily mineral requirement of human than branded rice varieties in Sri Lanka. Pigmented rice has more nutritional value than non-pigmented rice according to generated results. Widely consuming rice cultivars in Sri Lanka are quite safe from heavy metals contamination.

V ACKNOWLEDGEMENT

This study was financially supported by the Sri Lankan Treasury. The authors gratefully thank Industrial Technology Institute for the assistance in this research.

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The Effects of Industrial Effluents discharged on Surface Water Bodies- Case Study of Kitwe Stream, Zambia

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DOI: 10.29322/IJSRP.10.09.2020.p10591

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10591>

Abstract

Kitwe stream is the recipient of the effluents from the industrial Plants and flows into the Kafue River, an extremely important river to the Zambian economy. Samples were taken from the stream at 5 different sites. The stream was studied in an effort to determine by chemical means the water quality at various sites and hence the pollution levels of the stream. The water were analyzed for pH, total dissolved solids and total hardness. The results obtained revealed that the values for pH, total dissolved solids and total hardness were outside the recommended limits of WHO water quality standards. It was therefore, concluded at 5% level of significance that the effluents from industrial Plants have an effect on the pollution levels of the stream.

Key Words: Total hardness, Total Dissolved solids, pH, Effluents, Water Pollution

Introduction

The discharge of industrial effluent into water bodies is one of the main causes of environmental pollution and degradation in many cities, especially in developing countries. Many of these industries lack liquid and solid waste regulations and proper disposal facilities, including for harmful waste. Such waste may be infectious, toxic or radioactive (WHO, 2004). In most countries the principal risks to human health associated with the consumption of polluted water are microbiological in nature as well as chemical contamination. (UNCED, 1992) stated that an estimated 80% of all diseases and over one-third of deaths in developing countries are caused by the consumption of contaminated water and on average as much as one-tenth of each person's productive time is sacrificed to water-related diseases. The Third World Centre for Water Management estimates that at least three billion people worldwide still drink water of dubious quality. They have also estimated that only about 10-12 per cent of domestic and industrial waste water produced in Latin America is properly managed (Asit and Peter, B, 2014). This situation is similar in developing countries in Asia and likely worse in Africa.

Kitwe stream is located around Kitwe town. This stream carries effluents discharged from major industries around Kitwe. Industrial activities in these areas have significantly affected the ecology of this stream. Industrial effluents are discharged into the stream almost exclusively without adequate treatment which results in nutrient enrichment, the accumulation of toxic compounds in biomass and sediments, loss of dissolved oxygen in water and other nuisances (Ntengwe et al., 2006). Downstream, the water is highly coloured, turbid and the vegetation along the streams appears scorched despite the fact that water from this stream is a major resource in the area. It is used for cleaning, construction of buildings, irrigation of vegetables, drunk by animals and birds, and children use it for recreation.

Since water pollution implies reducing the available quantity and quality of water that can be used by both humans and the general environment (Petersson et al, 2001), it is extremely important that the use of water and its management take into account reducing and avoiding water pollution to maintain its quality. It is in the light of the above that a research was undertaken to; evaluate the chemical quality of water in Kitwe stream; assess the level at which effluents discharged from the industrial activities affect the quality of water of Kitwe stream; compare the quantity of pollutants in the water with the acceptable limits of WHO and establish the potential public health threat the water could have. The findings of the research, are important not only to the management of the industries in Kitwe but also to other industries in other towns that might be discharging effluents on water bodies, the policy makers and serves as a check on the work of Zambia Environmental Management Agency (ZEMA).

Therefore, the chief purpose of this paper is to report the findings of the research which was carried out to assess the effects of industrial effluents discharged on the surface water of Kitwe stream.

In order to ensure an orderly discussion, the paper is divided into five chapters. The first chapter is this introduction. The second chapter presents the conceptual and theoretical framework of the effects of industrial effluents discharged on water bodies. The third chapter discusses research methods used to undertake the study. The fourth chapter discusses the analysis and results of the findings. The last chapter is the conclusion which proposes policy recommendation to resolve the problem of the discharge of industrial effluents on surface water bodies.. Figure 1 below shows the location of Kitwe stream passing through industrial area leading to Kafue River

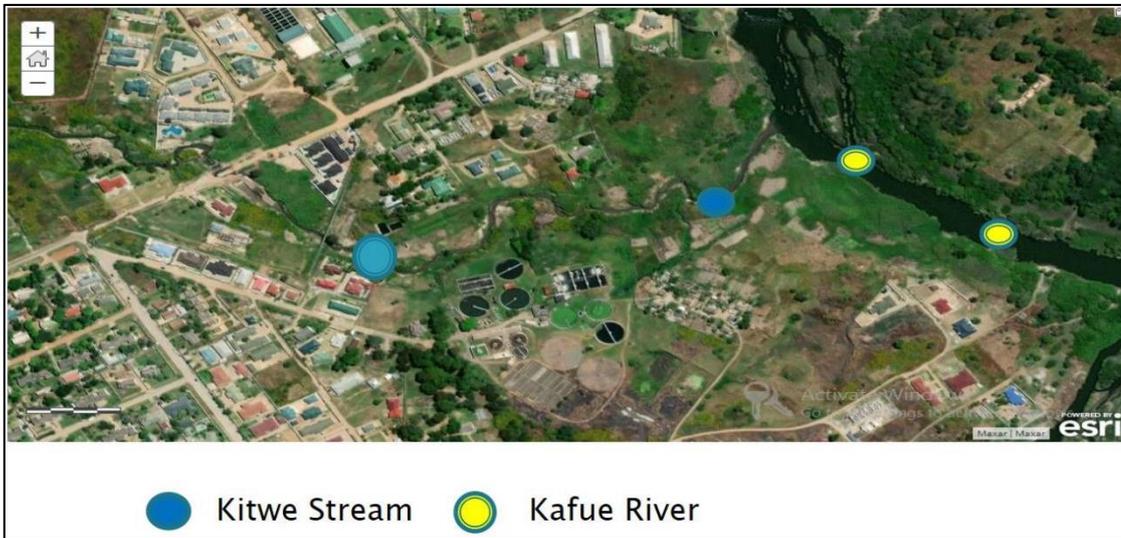


Figure1: Location of Kitwe Stream

Literature Review

Water pollution due to discharge of untreated industrial effluents into water bodies is a major problem in the global context (Mathuthu et al., 1997). The problem of water pollution is being experienced by both developing and developed countries. Human activities give rise to water pollution by introducing various categories of substances or waste into a water body. The more common types of polluting substances include pathogenic organisms, oxygen demanding organic substances, plant nutrients that stimulate algal blooms, inorganic and organic toxic substances (Cornish and Mensahh, 1999).

Waste water from industries and sewage spillages from burst pipes in urban centers in Zambia are released into streams and wetlands which finally discharge into Kafue River. With the prevailing hard economic situation in the country, most of the trade waste effluents are released into the environment untreated or partially treated. Industrialists have adopted the use of substandard treatment methods that partially treat and in some instances, forego the effluent treatment process. Industrialization is expanding rapidly in Zambia particularly in Kitwe District. Industry is growing in this area because the Zambian Government has reinforced the policy of industrialization to help recovery of the economic status lost in the 1990s. However, there has been little regard to the effects of most industrial wastes to the environment and to whether the industries would leave the environment as it were or would have some adverse impact.

Today, the most affected part of the environment is the water resources. A study carried out by the (Samerendra and Mirriam, 2014) indicated that most factories in Zambia particularly on the Copperbelt do not have effluent treatment plants, even where they are existing, most industrial wastewater treatment plants are poorly designed and constructed. In addition, it was found that Pollution from KCM's tailing dam number 2 (known as TD2) has contaminated the water supplies as well as mushishima streams which runs nearby Helen and Shimulala communities in Chingola. Local resident reported that KCM drilled them a borehole after the stream became contaminated but when they took samples it was also polluted with copper sulphate. They alleged that a water tank subsequently delivered by the company also contained contaminated water. With no clean water source in their village residents now walk to a shallow well they have dug in marsh to fetch dirty water. They fear this may also be polluted.

Effluent characteristics and water quality

Water pollution is commonly defined as any physical, chemical or biological change in water quality which adversely impacts on living organisms in the environment or which makes a water resource unsuitable for one or more of its beneficial uses (UNEP/WHO, 1988). Virtually all categories of water use contribute to pollution. Every time water is used, it acquires one or more contaminants and its quality declines. Whenever any resource is processed or consumed, some of it becomes waste and is

disposed of in the environment. In a large number of cases the waste materials are or become water borne and contribute to water pollution.

Both the nature of a pollutant and the quantity of it are important considerations in determining its environmental significance (UNDTCD, 1991). (Samerendra and Mirriam, 2014), stated that in 2006 KCM released raw effluent from their pollution control dam into mushishima stream, which runs directly into the Kafue River, the water source for 40 percent of Zambia's population (Sinkala et al., 2002). The result was some of the worst contamination Zambia has ever seen, with chemical concentration 10x acceptable levels of copper, 770 x acceptable manganese and 100x cobalt in the Kafue River, turning it into a strange blue green colour. Water companies in Kitwe and Chingola sued KCM for their negligence, which had damaged their water processing plants, and Vedanta compensated them out of court. But they refused to settle any compensation with the thousands of people affected by drinking the water. Following the failure of Environmental Council of Zambia (ECZ now ZEMA) to prosecute the company, a Lusaka private lawyer took a public interest litigation against KCM on behalf of 2000 affected people. However, Vedanta challenged the case claiming that they were not responsible for the contamination. Until now the case has not been heard and the residents are yet to be compensated. The long term effects being experienced by the local people are miscarriage, and premature and deformed birth. The likely long term impact of the spill may include lung and heart problems, respiratory diseases and liver and kidney damage. Brain damage effects in the local population may only show up in future generation (Mwase et al., 2002). In 2010 KCM again contaminated the river again, in another major incident which left thousands poisoned once again. They were found guilty by Zambian courts on four counts, including willfully failing to report an act or incident of pollution of the environment.

Situation of worldwide urban river pollution

Chinese, Japanese and Indians are among the major investors that are bringing direct foreign investments to Zambia. Therefore, we thought it wise to review the literature about the state of the rivers in their countries in term of pollution and what we found is as follows:

From the years 1932 through to 1968, the Chisso Corporation located in Kumamoto in Japan dumped an estimated 27 tons of mercury compounds into the Minamata Bay. Kumamoto is a small town which consists mostly of farmers and fishermen (Nakamura et al., 2006). After the mercury was dumped into the bay, thousands of people whose normal diet included fish from the bay developed symptoms of methyl mercury poisoning. The poisoning resulted from years of environmental destruction and neglect from the corporation. A disease was noticed in the region in the 1950s. The mercury poisoning affected humans' limbs, speech, vision, and mental capacity. Animals were affected as well. A river flows into other areas in Japan from the bay, causing the disease to be spread to these areas as well. The corporation began to make deals with the victims which absolved the corporation of any further liability. Victims were still being compensated as of 1993, (Asit and Peter, B, 2014)

In 2011, more than half of china's largest lakes and rivers were deemed unfit for human consumption. To this effect particularly since 2012, Ecological Civilization has been included in the plan to promote coordinated economic, political, cultural, social and ecological advancement. In this respect, the Chinese government actively promotes rehabilitation of heavily polluted water bodies in urban areas (Hailong, 2019). In 2013, China's Ministry of Environmental Protection admitted that "toxic and hazardous chemical pollution has caused many environmental disasters, cutting off drinking water supplies and even leading to severe health and social problems."

India's situation is not much better, with the state run Central Pollution Control Board reporting in 2013, that nearly half of the country's 445 rivers are too polluted in terms of biochemical oxygen demand and coliform bacterial to be safely consumed. If other pollutants such as nitrates, fluorides, pesticides and heavy metals were considered the figure would be significantly higher, (Asit and Peter, 2014). The urban stream syndrome (Meyer et al., 2005) that is characterized by high peak flows, owing to dramatic increases in storm water runoff, as a result of increasing impervious surface covers (ISC) in urban catchments (Booth and Jackson, 1997), causes significant physical and biological changes in urban rivers.

Methodology

Data Collection

The data collection process included both secondary and primary sources. The primary sources where the data was collected during the research process included; direct observation and collection of samples from the water bodies, consultations from Environmental Department of some industries, Kitwe city council and from interviews with the local people of 'Zambia Compound'. A secondary source was only from reviewing relevant literature and studies.

Research Design

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10591>

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A reconnaissance survey of the stream was first undertaken and systematic sampling was then used to establish 5 sites along the stream. Since rivers are dynamic systems and are subjected to too much variation, only a few stations with sufficient samples were required to define the results in terms of statistical significance. The first station was located sufficiently downstream from the point of pollution entrance to ensure dispersion through the cross section, and also to afford an opportunity for adequate mixing but not far enough for biological chemical degradation. The other 4 stations followed at equal intervals of 150m. These distances were measured using time factor and were designed to give the complete contamination picture of the stream. Two samples were collected from each station at the middle of the cross section of the stream. One sample was taken at the depth of 60% and the other sample from the surface. Since 5 sites were established, in total 10 samples were collected and taken to the laboratory for analysis.

Two samples from each station were mixed to have one homogeneous sample for each station. Therefore we only had 5 samples to analyze

Experiments for pH

Material used

- 5 beakers, 1 funnel, pH meter model 630, Thermometer (range -10 to 110 °C), Buffer solutions of pH = 7 and pH=4 with the temperature of 25 °C

Procedure

- The pH meter was calibrated using the pH buffer 7 and 4
- Samples were put into 5 separate beakers and tested for pH

Experiments for Total Hardness

Material used

- Burette, Pipette, 5 conic flask, 1 funnel, Clamp stand and Volumetric flask

Reagents

- EBT, EDTA, NH₃ OH and Indicator

Procedure

- 5ml was pipette from each sample and dilute with 20ml of distilled water
- 2cm³ of NH₃ OH buffer and 3-4 drops of EBT were added
- Then titrate with EDTA and record the volume of EDTA used to reach the end point

Equation (1) was used to calculate the total hardness

$$ppm = ml \times dil \times conc \times \frac{1000}{v} \quad (1)$$

where,

ppm= Total hardness in mg/l

ml = Volume of the sample in ml

dil = Dilution factor

conc= Concentration of EDTA in mg/l

v = Volume of EDTA used in litre(l)

Experiments for Total Dissolved Solids

Material used

- Pipette, 5 small heating dishes, Weighing scale and Heater

Procedure

Firstly the weight of each dish was measured and recorded. Then 10ml of each water

sample was put on 5 separate dishes and heat to dry. After heating to dry the weight of each dish was measured and recorded. The weights of the dissolved solids were calculated by subtracting the initial weight from the final weight of the dishes. Equation (2) was used to convert the weight into ppm.

$$ppm = \frac{(w \times 1000)}{10}$$

where, ppm = concentration of dissolved solids in mg/l

W = weight of the dissolved solids in mg

Assumptions

The study was carried out under the following assumption:

1. There was steady flow of the stream during the time of sample collection.
2. The stream has a uniform depth
3. The samples were collected at constant temperature.
4. The concentrations of the pollutants were as result of effluents from industrial plants and nothing else.

Scope and Limitations

The study was only focused on the assessment of the effects of effluents discharged into Kitwe stream. The main variables that were measured in the samples from the site are pH, Total Dissolved Solids and Total Hardness. Statistical analysis and conclusions were made based on the results that were obtained. The following are some of the limitations that were faced:

- Lack of enough resources to analyze adequate number of samples and the concentration of heavy metals in the samples.
- Lack of adequate information from Environmental departments of most industries.

Statistical Analysis

The results of all three variables were analyzed using student t- distribution at 5% level of significance. This test was chosen because the sample size in the entire three variables was less than 30 and the results are assumed to be normally distributed. The sample means were analyzed with respect to WHO maximum standard values which are as follows:

- Dissolved solids = 1000mg/l
- Hardness = 500 mg/l
- PH = 6.5 – 8.5

Research Findings And Discussion

The research findings after carrying out all the procedures were as follows:

According to data from the finding of our research, pH varied significantly along sampling sites and ranged between 4.5 and 6.7 (Figure 2). Low pH values outside WHO permissible limits were observed at sites A, B, C and D. The low pH levels in water could be due to the raw materials such enzymes, lactic acid, benzoic acid and yeast that is mainly used by food industry (Chennakrishnan, 2008). pH values within WHO permissible limits (range, 6.5-8.5) were observed at site 3 (6.7). The high value of pH at site 3 is attributed to the basic effluent from a nearby industry that is discharged close to this point. The high value observed in the water downstream is probably due to the use of alkaline sodium hydroxide (NaOH) as a cleaning agent in these industries

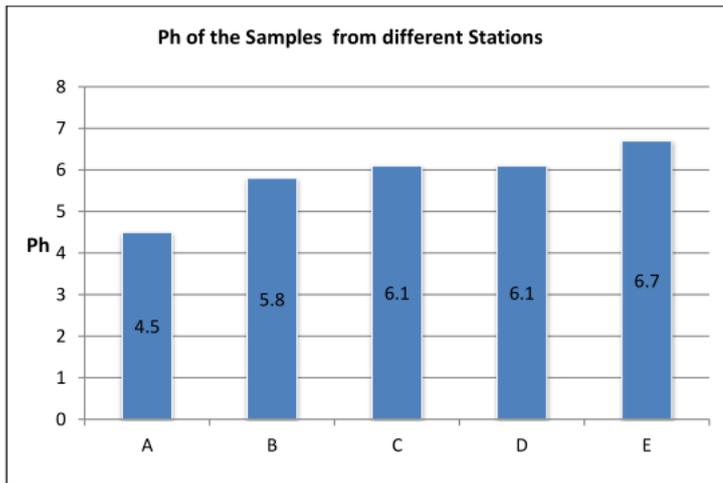


Figure 2: pH. Trends

However after subjecting this data to statistical analysis using student t-distribution at 5% level of significance, it was concluded that the effluents from the industrial plants have an effect on the pollution levels of the stream in terms of the pH. The pH is a measure of the acid balance of a solution and is defined as the negative of the logarithm to the base 10 of the hydrogen ion concentration (UNESCO, WHO & UNEP, 18 1996). As reported by Salequzzaman et al, (2008), pH changes can tip the ecological balance of the aquatic system and excessive acidity can result in the release of hydrogen sulfide. The pH of water affects the solubility of many toxic and nutritive chemicals; therefore, the availability of these substances to aquatic organisms is affected.

Total Dissolved Solids (TDS)

TDS, which stands for Total Dissolved Solids, refers to the amount of organic and inorganic dissolved substances that may be found in your water, such as minerals, metals and salts. Essentially, it is everything present in water other than pure H₂O and suspended solids. Total Dissolved Solids are measured as parts per million (ppm), and it is worth noting that WHO water standards recommend a limit of 1000 ppm. The concept of parts per million may be difficult to visualize, but the same measurement can be stated as “milligrams per litre” when you discuss mineral content. The TDS varied along sampling sites, fluctuating between 81,000 mg/l to 199,000mg/l (Figure 3). High values of TDS were observed at all the five sites which were far much above the WHO permissible limit of 1000mg/l. The high levels of TDS could be due to the effluents coming from mining activities which involve the washing of the rocks. The increasing trend in TDS along the stream can also be attributed to the fact that water is naturally slightly acidic, hence as it flows there is a continuous dissolving of the rock particles carried with it into a liquid form. These dissolved minerals include calcium, magnesium, chlorides and silica. However a sharp decrease in the TDS was observed at site E and serves as evidence that the stream is naturally trying to dilute, disperse, degrade, absorb or otherwise reduce the impact of unwanted residue. TDS affects the taste of water and beverages, and can mean that sodium, calcium, chloride, and magnesium may all be detectable in your final product. Depending on the quantities and combinations of the dissolved materials, water can taste alkaline (bitter), salty or metallic.

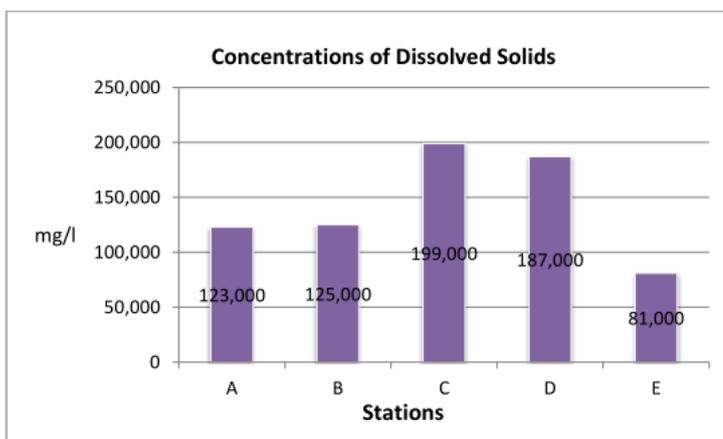


Figure 3: Concentrations of Dissolved Solids

However after subjecting this data to statistical analysis using student t-distribution at 5% level of significance, it was concluded that the effluents from the industrial plants have an effect on the pollution levels of the stream in terms of TDS. The calculated

average TDS value of 142 000mg/l together with the results of statistical analysis indicated that the self- purifying capacity of the stream has been overloaded.

Total Hardness

Water hardness is the traditional measure of the capacity of water to react with soap, hard water requiring considerably more soap to produce lather. Hard water often produces a noticeable deposit of precipitate (e.g. insoluble metals, soaps or salts) in containers, including “bathtub ring”. It is not caused by a single substance but by a variety of dissolved polyvalent metallic ions, predominantly calcium and magnesium cations, although other cations (e.g. aluminium, barium, iron, manganese, strontium and zinc) also contribute. Hardness is most commonly expressed as milligrams of calcium carbonate equivalent per litre. Water containing calcium carbonate at concentrations below 60 mg/l is generally considered as soft; 60–120 mg/l, moderately hard; 120–180 mg/l, hard; and more than 180 mg/l, very hard (McGowan, 2000). However in our study we considered the concentration of both calcium and magnesium ions hence the term total hardness. Total hardness showed a downward trend along the stream from 657.5mg/l to 540mg/l (Figure 4). However, at every site the total concentration of magnesium and calcium ions were beyond the WHO permissible limit of 500mg/l. These high figures of total hardness could be attributed to the effluents coming from the mining industries in the area and other industries involved in the use of sedimentary rocks like stone crushing. The average total hardness was found to be 604.5mg/l and after statistical analysis of the data it was discovered that the stream purifying capacity has been overloaded. It was therefore concluded that the stream has been polluted by the effluents discharged on it from the industries.

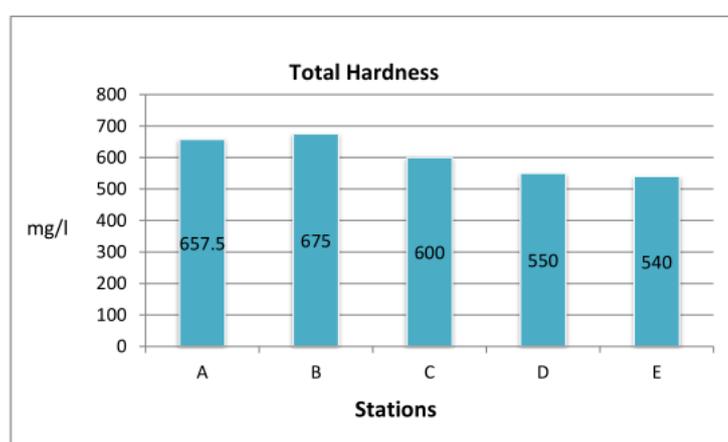


Figure 4: Total Hardness

These figures are very alarming as hard water can also have corrosion tendencies. It contributes to corrosion of metal surfaces and pipes, resulting in the presence of certain heavy metals, such as cadmium, copper, lead and zinc, in drinking-water. Corrosion can be associated with health risks (from leachates such as lead, copper and other metals) and reduced lifespan of the distribution network and appliances (e.g. water heaters) using water. In addition to that, exposure to hard water has been suggested to be a risk factor that could exacerbate eczema. A suggested explanation relative to hard water is that increased soap usage in hard water results in metal or soap salt residues on the skin (or on clothes) that are not easily rinsed off and that lead to contact irritation (Thomas & Sach, 2000).

Conclusion

Overall, the study has shown that the effluents from industries have a big impact on the water quality of Kitwe streams. This is depicted by the fact that there is higher concentration of the parameters analysed along the stream as compared to the WHO permissible limits. Although the values in some cases were lower than the maximum allowable limits by WHO, the continued discharge of un-treated effluents in the stream may result in severe accumulation of the contaminants. With the present primitive processing technology, in both extractive and manufacturing Industries on the Copperbelt, their activities will continue to enrich Kitwe stream with key nutrients and easily degradable carbon compounds, leading to further oxygen depletion in streams. In addition to degradable carbon compounds, these Industry discharges high loads of inorganic compounds; these substance are likely to accumulate in the streams and pollute the Kafue River if it not treated at the source. This is a situation that should alert the Zambia Environmental Management Agency.

Recommendations

The following are the recommendations that were made:

1. The industries should make use of emerging technologies, of waster water treatment before discharging into the stream;
2. The Government should ensure that there is an adequate system of environmental policies, laws and their enforcement.
3. Institutions like Engineering Institute of Zambia (EIZ) in collaboration with other stakeholders to mobilize technocrats with innovate ideas in order to find new ways of managing industrial effluents
4. Further research should be carried out to find out the concentration of heavy metals in the stream.

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10591>

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Re-Evaluation Of Succession And Invasion Of Land Use/Land Cover Changes In Dadin Kowa, Jos, Nigeria

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DOI: 10.29322/IJSRP.10.09.2020.p10592

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10592>

Abstract- Succession and Invasion is fundamental of increase in land use and land cover (LULC) changes in the global environment. Despite its global importance, decisions on land use management have considered less attention to the impact of succession and invasion in LULC changes. This research is aimed to evaluate the impact of succession and invasion on LULC change in Dadin Kowa, Jos, Nigeria from 1962-2016. Aerial photographs of the study area (1962 (1: 9,000), 1971(1: 10,000), 1991(1: 6,000), were processed using photogrammetry technique, and the 0.6m resolution Quick Bird satellites imagery for the year 2015 and 2016 were processed using Remote Sensing technique and Geographical Information System techniques was used for the analyses. The results revealed that in between 1962-1971, 1971-91, 1991-2005 and 2005-2016 the built-up area, forest and water bodies invaded agricultural land use and increased gradually from a total of 29.609ha to 90.073ha and to 209.832ha. This increase led to an overwhelming decrease about 380.059ha of agricultural land by 2016. The Land Cover Changes revealed a rapid increase in residential use and a substantial decrease of agriculture and vegetation land use and rock outcrops. It was concluded that one of the biggest problems of LULC change and its management is the ability to reconcile conflicting goals and their uses, and secondly human activities over time modify the direction of succession and invasion resulting into several lasting effects as revealed in this study. Thus, recommending the use of Geospatial techniques for Land use Land cover change detection and analyses.

Index Terms- Land Use, Land Cover, Succession and Invasion, Remote Sensing and Geographical Information System Techniques

I. INTRODUCTION

Rapid urbanization and infrastructure development have modified landscape characteristics through changes in Land Use and Land Cover (LULC) types across the world (Puech et al. 2015). Knowledge of Land Use (LU) and Land Cover (LC) is important for planning and management activities and considered as an essential element for modelling and understanding the earth as a system. LC maps have presently developed from local to national and global scales (Nagarajan and Poongothai, 2011). However, studies on LULC changes have been conducted mostly in developed countries since post-industrial age due to more

governments' attention to ecological and environmental issues than those in the developing countries. Additionally, human activities affect landscape characteristics at a faster rate in prosperous developing countries than in developed countries. The environment sustains man and other living things around a man (Ogunlami, 1994). For example, urban growth and the concentration of people in cities are creating social problems such as flood, urban sprawl, deforestation, erosion worldwide. The environmental consequences of the rapidly increasing growth of cities in many parts of the world have attracted much research attention in both developed and developing countries. One of such effects which offer ample opportunities for study relates to the LC implication of the change as it affects the socio-economic lives of people (Zubair, 2006).

II. LULC CHANGE DETECTION

Change detection is the process of identifying differences in the state of an object or phenomenon by observing it at different times (Singh, 1989; Lu et al., 2004). Change detection is used for diverse applications such as evaluation of Land Use (LU) change, monitoring of shifting cultivation, assessment of deforestation, the study of changes in vegetation phenology, damage assessment, disaster monitoring, day/night analysis of thermal characteristics and other environmental changes (Singh, 1989). The use of panchromatic, medium-scale aerial photographs to map LU changes has been an accepted practice since the 1940s. More recently, small-scale aerial photos and satellite images have been utilized for mapping LULC change detection. LC changes can be observed as one of the most sensitive indicators of land use interactions. Change detection on LC mainly focus on four aspects, (1) detecting if any change has occurred, (2) identifying the nature of the change, (3) measuring the areal extent of the change, and (4) assessing the spatial pattern of the modification. Since the spatial pattern of the LU changes is regarded as a good indicator of the impact of the other three aspects, its research has become quite active in change detection (Lu et al., 2004). Chiroma et al (2018), have used satellite imagery to study land use changes in Maiduguri, Nigeria. Many change detection methods have applied using remote sensing to monitor LC changes and identify the patterns of change and derive more understanding of the consequences of LULC modification to achieve more accurate model of the changing tendency of LULC (Achuenu and Ayuba, 2015; Aplin, and Curran, 1999; Asadi, et.al. (2012), Baldocchi,

2015; Keefe, 1977; Koladade, 1992; Lambin and Ehrlich, 1997; Marsland, 2009 and Meyer, 1995). In general, remote sensing change detection methods have two broad classes. They are bi-temporal change detection analysis and temporal trajectory analysis. The former was based on the comparison between two dates, and the latter analyzes the tendency of change in multiple periods or a continuous time scale (Lillesand et al., 2004).

Thus, this research is focused on the successive and invasive changes by conversion between LULC in Dadin Kowa area of Jos, Nigeria. The extent of alteration may vary with population numbers, stage of economic development, the age of culture and other factors. Some modifications have been introduced through the acts of industrialization, deforestation, mining, scarification, construction and agricultural activities. The above mentioned environmental parameters require continual information to enable proper monitoring, such information is called geographical information; information relating to a particular location on the earth (Radwan, 1991). Adequate information on LULC is essential to ensure proper planning and management of land uses in towns, cities and metropolitan areas. Adequate information on the historical trends of LULC changes be documented (www.gisdevelopment.net, 2013). This will form baseline data for analysis of the past and present, from which the future demand for each LU activity is projected, and subsequent planning for land-use zoning as designed.

III. SOCIOLOGICAL THEORY OF NEIGHBORHOOD CHANGE:

The urban theory used in analyzing land use/land cover for this study is adapted from sociological theories of neighborhood's change. Weinstein (2007) studied land-use/ land-cover from the sociologist point of view using the concepts of succession and invasion which describes two different but complementary processes of neighbourhood change in urban areas'. Weinstein (2007) further compared what he termed "Old urban sociology" of Park and Burgess (1925), which used the theory of Concentric Zone Model to explain patterns of growth and development, through invasion, succession, natural areas, urbanism, competition, transition zone and decentralization. Park and Burgess (1925) developed a theory of urban ecology which proposed that cities are environments like those found in nature, governed by many of the same forces of Darwinian evolution; which affects natural ecosystems. When a city grows, people and their activities cluster in a particular area (this is the process of "concentration"). Gradually, this central area becomes highly populated, so there is a scattering of people and their activities away from the central city to establish the suburbs (this is "dispersion"). This theory used human adaptation through invasion to change their physical environment. According to views by, these "New Urban Sociologists which emerged in the 1980s cities are viewed as "growth machines" with emphasis on how different parcel of Land is used and developed on social conflicts, capitalist economic forces combined with political decision-making processes according to Marxian Model of society. Where all development shares the same interest: are pro-growth mentality and a pro-business agenda, by the people and for the people.

Although. Park and Burgess (1925) original ideas of the concentric zone theory have not stood the test of time, his basic

argument that cities have spatially distinct zones that interact via ecological mechanisms of the competition of invasion and succession has survived in a number of forms. Invasion is the process by which a new category of people or type of land use arrives in an area previously occupied by another group or type of LU; while succession is the process by which a new category of people or type of LU gradually predominates in an area formerly dominated by another group or type of land use (McKenzie, 1924). Succession mostly applied in ecological concepts in two forms; Primary and secondary succession. Primary succession is one of two types of the biological and ecological succession of plant life, occurring in an environment in which new substrate devoid of vegetation and other organisms usually lacking soil, such as a lava flow or area left from a retreated glacier, is deposited. In other words, it is the gradual growth of an ecosystem over a longer period (Walker and del Moral, 2015).

In contrast, secondary succession occurs on a substrate that previously supported vegetation before an ecological disturbance from smaller things like floods, hurricanes, tornadoes, and fires which destroyed the plant life. It is a process following severe disturbance or removal of a pre-existing community (Baldocchi, 2015). This process of regrowth called secondary succession is different from primary succession because there has already been a community of life in the area of the disturbance, and there is typically still some life present. This is unlike primary succession where you begin with bare rock - no life - even though the ecosystem in question may have been drastically altered. There is soil, which may be housing seeds, nutrients, and other vital components that will make the recolonizing by the growth of producers, typically plants, occur much more quickly. The stages of primary succession include pioneer plants (lichens and mosses), grassy stage, smaller shrubs, and trees. Animals begin to return when there is food there for them to eat. When it is a fully functioning ecosystem, it has reached the climax community stage (The U.S. Department of Agriculture, retrieved 2013-09-30). Secondary succession is much more commonly observed and studied than primary succession. Particularly common types of secondary succession include responses to natural disturbances such as fire, flood, and severe winds and response to human-induced disturbances such as logging and agriculture.

The concept of Ecological approach in primary and secondary succession and invasion can be used to study the pattern of urban land use and land cover (LULC) change. According to Cumming (2008), the concept is of benefit to LC studies because it provides a clearer description of the mechanism and framework to the study LC changes. He further states that Ecological approach to LC study has a much stronger approach at analyzing models based on simple and clearly defined theory-derived mechanisms and such theoretical sight can be adapted in analyzing land cover change that offers useful insights into ways of viewing and understanding LULC changes. Ecological approaches thus have considerable potential in the analysis of spatial resilience in landscapes from LC maps inclusive of some potential weaknesses. There are several challenges in bridging the gap between ecological approaches and LC analyses of which one of it, is to carefully look up the different processes used in the study of the same kind of LC types. Secondly when applying ecological approaches to the analysis of LC and spatial resilience lies in the differences in the mechanisms driving LU and LC as opposed to

those driving changes in plant and animal communities. This is because LC change in the twenty-first century is largely caused by anthropogenic and human activities, though some land cover change may arise out of the interaction between social and ecological systems that affect LC change. Another recent review demonstrates current models used to test ideas on LULCC even though the focus of most land use models has been to develop applications that facilitate decision making in a particular context and ignoring the potential for feedback mechanisms (Matthew, et.al, 2007). This kind of insight can help to quantify alternative scenarios for future land use changes and to explore how spatial and time variation influences influence by the complex system because just as cities occur within a particular landscape, it also occurs within a period of history.

The renowned sociologist Mckenzie (1924) was one of the first to propound the theory of "invasion and succession" in explaining how ethnic group replaces themselves. They suggested that, over time, the competition for land and other scarce urban resources leads to the division of the urban space into distinctive ecological niches, "natural areas" or zones in which people share similar social characteristics because they are subject to the same ecological pressures. As a zone becomes more prosperous and "desirable", property values and rents rise, and people and businesses migrate into that zone, usually moving outward from the city centre in a process called "succession" (a term borrowed from plant ecology), and new residents take their place.

Using two scenarios, McKenzie (1924) first compared this type of change to an environment change alongside change in its first sets of inhabitant's species of grasses and insects being overtaken by new species and animals which would also be replaced over time by the former. Secondly, he Likened invasion and succession to land use or economic activity of a community. Weinstein (2007) applied the concept of succession and renewal to Coney Island, a famous neighbourhood in New York City as the

case study for the application of the general principles and model involving the change in urban areas.

IV. MATERIALS AND METHODS

Materials used for this research are both hardware and software which includes:

Computer and its accessories,

ArcGIS is a Remote Sensing software,

ILWIS software was used to digitised the scanned image to softcopy and ,

Leica Photogrammetry Suite was used to processed the aerial photographs

V. THE STUDY AREA

Dadin Kowa neighbourhoods'is located in Jos South Local government of Plateau State, Nigeria. It is about 5 minutes' drive from Bukuru metropolis (Latitude: 9°48'00"N and Longitude: 8°52'00"E), the Headquarter of Jos South Local Government Area of Plateau State. It is bounded by four distant hills. It is initial settlers were the Berom tribe, an indigenous people of the Jos plateau. The community developed pre-1960 as a result of the mining and quarrying activities which experienced a lot of LULC changes over the years. Dadin Kowa is a good example, the secondary succession of LULC which occurred steadily since 1962 and more rapidly from 2001 to 2005 due to ethno-religious crises in Jos city. The crises led to the invasion and succession of the landscape by the continuous relocation of people and development of residential and commercial properties. The entire Dadin Kowa land area leaving only small unbuilt areas which consist mainly of trees, grasses and crops and others.

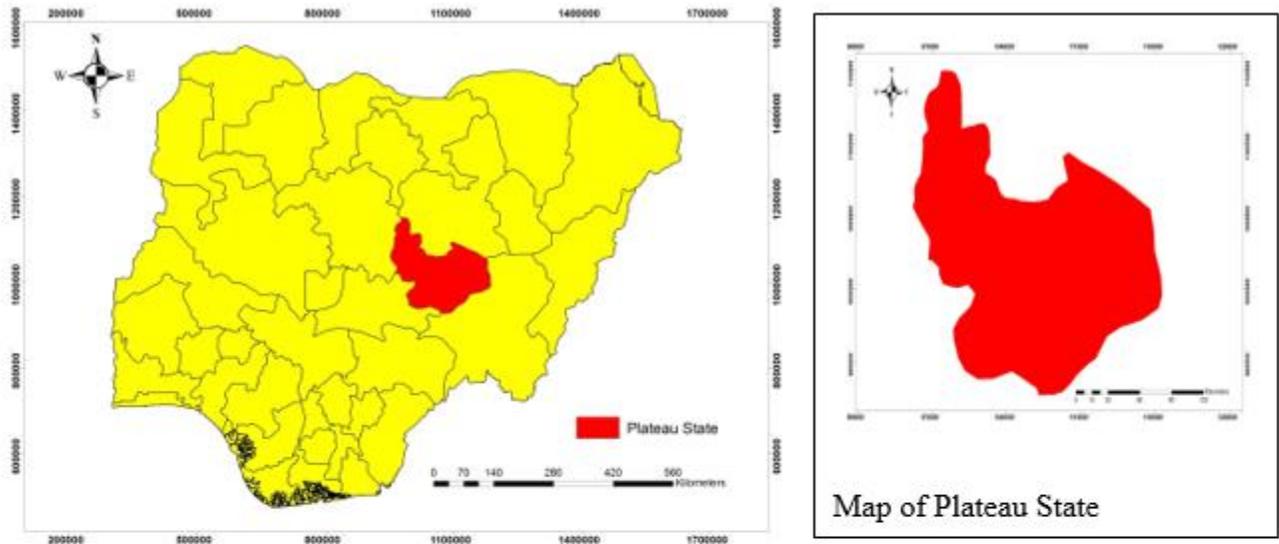


Figure 1: Map of Nigeria showing Plateau State



Satellite Imagery of Jos South Local Government
Source: (<https://www.plateaustate.gov.ng/government/lgas/jos-south>)

Data Sources and Establishment of Land Uses/Land Cover Classification

An area of 84000 m² was delineated on the Landsat scene covering Dadin Kowa the study area. Post-Classification change detection approach was employed due to its ability to bypass the problems and difficulties associated with the analysis of images acquired at different times of the year and sensors (Yuan et al., 1998). The study focuses mainly on seven independent land use/land cover classification and was achieved by supervised classification as follows: land cover changes; Built-up areas (developed areas) and agricultural land, forest areas, water bodies, rock outcrops, degraded areas and undeveloped areas respectively. The research was limited to the use of the aerial photograph of 1962, 1971, 1991, 2005 and 2016 satellite imagery alongside the use of topographic maps of Naraguta North East and a ground survey map of 2000 (update of 1976 maps) and field work to validate the change detection on the aerial photographs. That is because obtaining images at near image dates is considered important for change detection studies (Jensen and Im, 2007).

The images were corrected to rectify atmospheric effects and then geo-referenced using ground control points acquired by GPS. The images were re-sampled to 30m pixel size for all bands using the nearest neighbour method. The resultant root means squared error was found to be 0.53 pixels (about 16 m on the ground) between the 1962 and 1971 images, 0.51 pixel (about 15 m on the ground) for the 1991 and 2005 images. All the data were projected to a Universal Transverse Mercator (UTM) coordinate system, using three sets of sequential aerial photographs of Dadin Kowa for 1962 (1: 9,000), 1971(1: 10,000) and 1991 (1:6000), 2005 and 2016 satellite imagery of 0.6m Quick Bird resolution of the study area. Following the previously drawn scheme and transfers plan, areas of doubtful preliminary interpretation were particularly verified since there was no functional land-cover survey, it was, therefore, necessary to produce one at a scale and quality compatible with the study.

Land-cover data was transferred from the interpreted overlays to a base map with the aid of a digitizer. 1962, 1971, 1991, 2005 and 2016 land-use maps on a unified scale of 1:500 base map were overlaid on each other to produce a land-cover change map between 1962-1971, 1971-1991, 1991-2005 and 1991-2016. The transferred data became the preliminary land-cover map for the study area and it formed the basis of quantitative measurement for the land-cover changes analysis. To compare the four sets of data, the resulting values were converted to percentages. Based on the ground truth data, modifications were effected and classes, as well as their boundaries, were redefined and digitized. In order to make the classification scheme clear for understanding, the classification system used in this project is based upon categories which are partially exhaustive (no omission of any phenomena) and naturally, exclusive (no overlap of any category) because of the scale provided by the aerial photographs and the satellite imagery utilized. The methodology and classification scheme employed in this study was appropriate and compatible with the area under investigation and the study objective. The analyses of the causes of land-use/land-cover succession are also classified into; Initial causes and continuing causes as follows:

Succession and Invasion of LULC change in Dadin Kowa from 1962-1971

As shown in Table 1 the areal extents are presented in hectares. Table 1 and Figure 1 shows the initial cause of succession between the pre-1962 bases year and 1972 showed that factors such as the indigenous/original traditional settlements, their agricultural, water bodies and the natural vegetation and forest existed long before the industrial tin mining activities began on the Jos plateau.

These factors have resulted in the primary succession of the land use/land cover of the area. Dadin Kowa town started developing from pre-1960 as a result of the mining and quarrying activities that took place and since then it has experienced a lot of changes in its development over the years. With the advent of industrial large-scale tin mining activities began the secondary successional and invasive change on the land cover and land use of the area. Lands categorized as agricultural lands are given way to development due to gradual human invasion process and activities. The 1962-71 base year showed that the areal extent of Agricultural land was 45.29ha but over the span of 10-years gradual land cover change caused mostly by several human developmental activities by 1971 a total of 29.609 ha had been developed into urban land uses.

VI. RESULTS AND FINDINGS

Table1. Trends in Invasion and Succession of Land-Use/Land-Cover (LULC) change for 1962-71, 1971-91, 1991-2005 & 2005-2016

	S/ N	LCLU change detection	The areal extent of change detection in hectares (ha)							
			LCLU change distribution from 62-71 (ha)	Invasion and succession of LCLU from 62-71(ha)	LCLU change distribution from 71-91(ha)	Invasion and succession of LCLU from 1971-91(ha)	LCLU change distribution from 1991-2005 (ha)	Invasion and succession of LCLU from 1991-2005 (ha)	LCLU change distribution from 2005-2016(ha)	Invasion and succession of LCLU for 2005-2016 (ha)
LCLU type		Agricultural(Ag)	676.00-630.71		630.71-460.52		460.52-252.82		252.82-592.761	
Invasion/ succession in LCLU	1	Ag-DA		4.367		161.360		140.892		360.183
	2	Ag-DL		12.378		9.880		14.684		0.000
	3	Ag-FO		8.016		1.246		8.343		0.000
	4	Ag-RO		5.042		6.130		45.600		0.000
	5	Ag-VL		0.000		11.040		0.000		0.000
	6	Ag-WB		0.072		0.417		0.313		0.000
Total change	06		45.29	29.609	170.19	190.073	207.18	209.832	380.059	360.183
LCLU type		Vacant lands(VL)	00.00-00.00	00.00	00.00-14.34	00.00	14.34-9.880	00.00	00.00-00.00	00.00
Total change		00	00.00	00.00	14.34	00.00	4.46	00.00	00.00	00.00
LCLU type		Developed areas(DA)	11.71-14.02		14.02-195.83		195.83-413.27		413.27-598.78	
Invasion/ succession in LCLU	7	DA-Ag		0.516		4.129		0.000		0.000
	8	DA-DL		0.021		0.000		1.079		0.086
	9	DA-FO		1.009		0.000		0.000		0.000
	10	DA-RO		0.000		0.127		1.364		1.237
	11	DA-VL		0.000		0.845		0.000		0.000
	12	DA-WB		0.000		0.000		0.015		0.028
Total change	06		2.31	1.546	181.81	5.101	217.44	2.458	185.51	1.351
LCLU type		Degraded Lands(DL)	36.80-49.89		49.89-47.82		47.82-69.78		69.78-0.164	
Invasion	13	DL-Ag		5.076		1.322		12.489		17.243
	14	DL-DA		0.000		1.313		8.683		50.843

/succession in LCLU	15	DL-FO		9.904		0.000		0.000		0.000
	16	DL-RO		0.000		0.932		1.044		3.112
	17	DL-WB		0.000		0.409		0.000		0.000
Total change	05		13.09	14.98	2.07	2.976	21.96	22.216	69.616	71.198
LCLU type		Forest(FO)	00.00-40.52		40.52-35.68		35.68-12.59		12.59-00.0	
Invasion /succession in LCLU	18	FO-Ag		0.000		0.803		0.000		0.000
	19	FO-DA		0.000		2.111		16.242		9.163
	20	FO-RO		0.000		0.449		0.000		0.000
	21	FO-VL		0.000		1.363		0.000		0.000
	22	FO-WB		0.000		1.106		3.397		3.411
Total change	05		40.52	00.0	4.84	5.832	23.09	19.639	12.59	12.574
LCLU type		Rock Outcrop(Ro)	108.02-106.33		106.33-83.86		83.86-86.13		86.13-4.76	
Invasion /succession in LCLU	23	RO-Ag		0.432		3.616		0.836		20.552
	24	RO-DA		0.690		10.941		1.275		8.334
	25	RO-DL		0.347		4.487		0.500		0.000
	26	RO-FO		0.296		1.094		0.000		0.000
	27	RO-VL		0.000		0.974		0.000		0.000
	28	RO-WB		0.000		0.707		0.000		0.000
Total change	06		1.69	1.765	22.47	21.818	2.27	2.611	81.37	28.886
LCLU type		Water bodies(WB)	04.15-03.90		03.90-05.79		05.79-05.32		05.32-3.439	
Invasion /succession in LCLU	29	WB -Ag		0.000		0.000		0.131		0.176
	30	WB -DA		0.000		0.000		0.391		1.263
	31	WB-VL		0.000		0.174		0.013		0.374
	32	WB-DL		0.140		0.036		0.017		0.078
	33	WB-FO		0.193		1.469		0.000		0.000
	34	WB-RO		0.000		0.000		0.015		0.111
Total change	06		0.25	0.333	1.89	1.679	0.47	0.557	1.881	2.002
TOTAL			103.75	48.233	397.61	227.487	472.41	257.313	731.026	476.194

Source: 1962, 1971 and 1991 Aerial photographs and 2005, 2016 Satellite imagery.

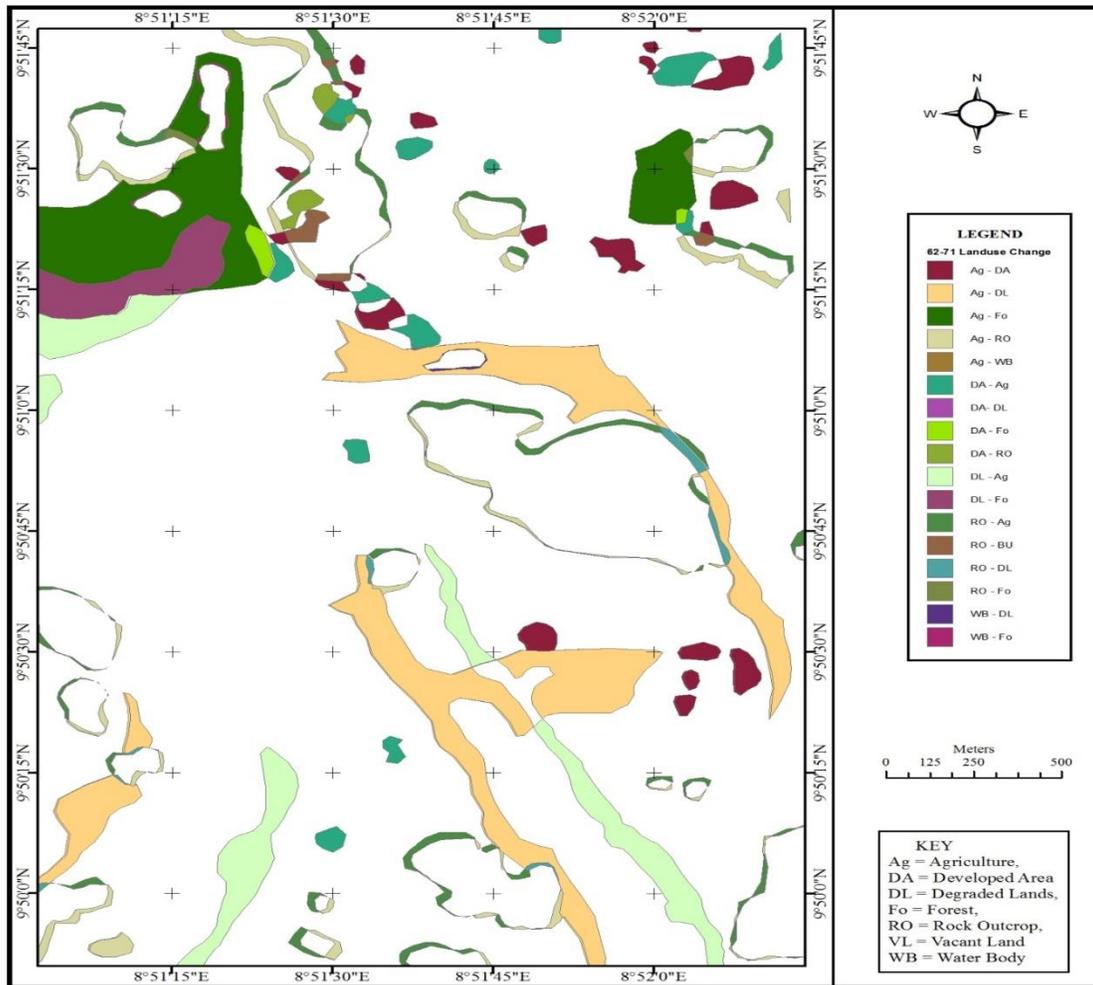


Figure 1: Trends in invasion/successions of land use/land cover change from 1962-1971.

The decrease indicated that Ag land use/cover has undergone invasion and succession with Ag-DL taking the lead with 12.378ha, reducing the areal extent of agricultural land area by 1971 (see Table 1). 8.016 ha indicated that between 1962-71 Agricultural land was converted to the forest (Ag-Fo) mostly Eucalyptus trees to aid in curbing degradation and wastelands, this situation altered the socio-economic status of the inhabitant of the study areas.

Succession and Invasion of Land use from 1971-1991

Between 1971-1991, the secondary succession became more eminent due to factors such as the conducive climate condition of the city of Jos, the gradual change of the

physiographic configuration of the landscape due to the tin mining activities within the area. This has influenced erosion and gradual depletion of the forest area which results to land the degradation. From 1962-1971 to 19971-1991, the invasion areal extent from FO-WB was 0.0ha to106 ha. This resulted in the increase of the level of water bodies and mined ponds from 0.25ha to1.89ha within the area as shown in Table 1 and Figure 2. Between 62-71 and 71-91 there was the record of change from 14.34ha to 0.00 changes in vacant land areal extent due to the planting of tree gardens and orchard interpreted as forest. The continuing causes are major as a result of the following factors; the rural/urban migration to Dadin Kowa while most trees then were cut down for the purpose of construction work and residential use.

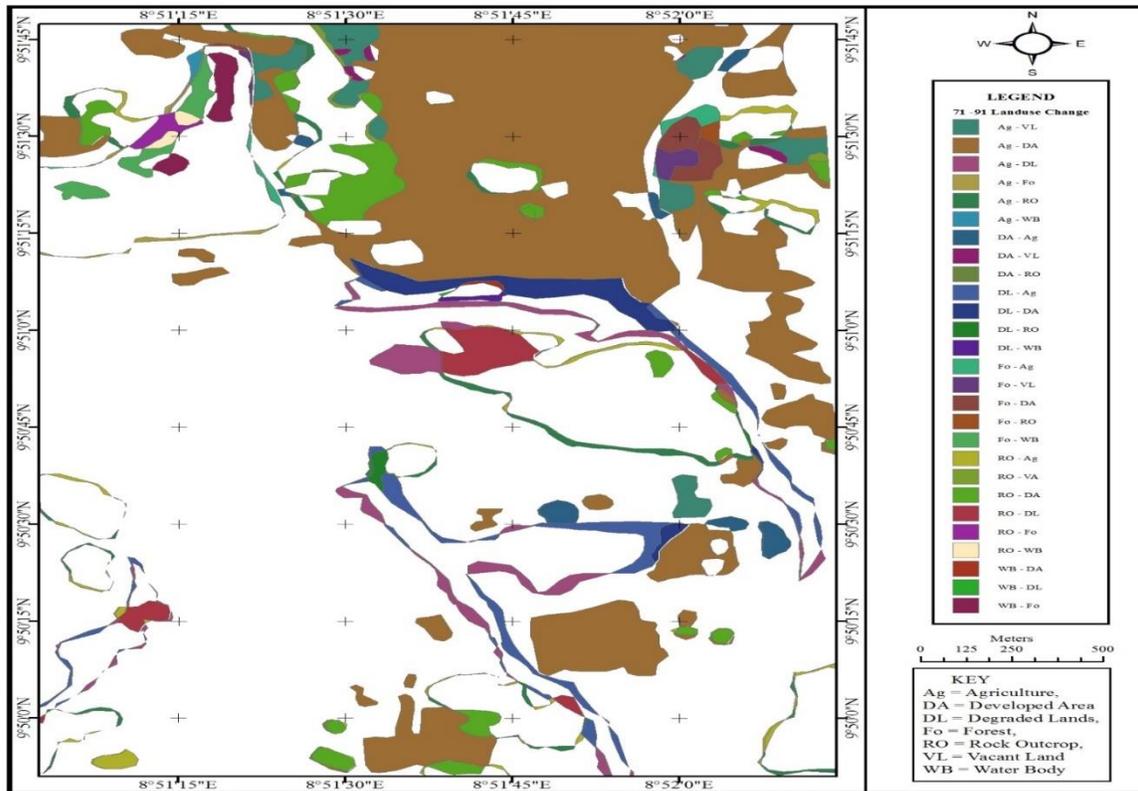


Figure 2: Trends detection in the evasion and succession of land uses/cover change from 1971-1991

Succession and Invasion of Land use from 1991-2005

The gradual inhabitation of Dadin Kowa from the 1990's to the year 2000, was boosted by the advent of security crises within Plateau state which resulted in the rapid relocation of people to Dadin Kowa for several reasons other than Tin mining. The period from 1991-2005 as shown in Figure 3 and Table 1, experienced

rapid growth, development and mass movement of people and property development in Dadin Kowa area. The movement became more prominent in the year 2000 immediately after the Jos religious crises, which led to the establishment of different settlements and continuous growth of Dadin Kowa area.

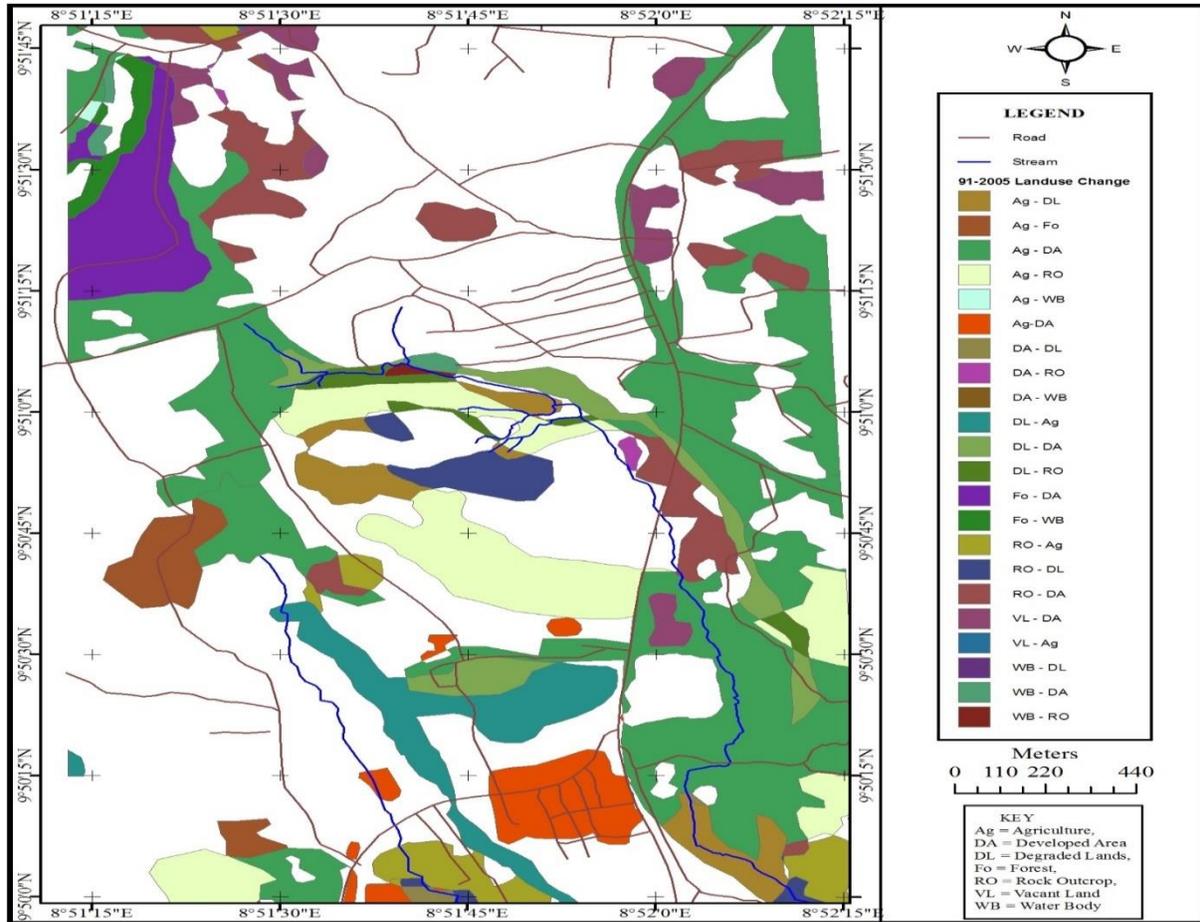


Figure 3: Trends in the evasion and succession of land uses/cover change detection from 1991-2005

The 2001-2005 ethnic-religious crises brought about a dramatic change to Dadin Kowa community in Jos both to its residential and agricultural, forest, rock outcrop and water body LULC. Before 91-2005 succession and invasion process pre-62-71 period had more residents in the mining camps and traditional occupants scattered around. The invasion was perhaps welcomed by the landowners, who benefited from the year-round rentals and sales of plots to the most dominant religious sects seeking succor and security mostly comprising of non- indigenous tribes from other states. The whole process has led to the establishment, spreading out and expansion of Dadin Kowa into new areas like Barkin Akawo, Zaramaganda and Kufang. At this continuing stage, several groupings and aggregation of settlements and residential building began to erupt everywhere. The settlers invade new areas gradually more migration has continued to take place. Thus in course of time, the immigrants scattered and invaded other land uses as a result of spreading out. Consequently, competition is especially more intense among the individuals for the resident in the process. It is interesting to note that due to this continuous movement of people between year 71-91 and 91-2005 there was an increase in the areal extent of invasion of Agricultural land from 170.19ha to 207.18ha, short of 36.99ha indicating a change to other land covers. Considering the analysis on land cover change of the study area, it is also noted that activities such as Tin mining and scarification led to increases in Vacant lands between 71-91 and 91-2005 from 0.00 to 14.34 but reduced to 9.880ha due to tree planting intervention was undertaken by the government in curbing further land degradation (see Figure.3). 91-2005 witness an increased change 19.639 ha of invasion from those of 00.0ha as

at 62-71 showing that changes occurred because of the succession of increased demand on development and water bodies taking over forested areas on their own.

Succession and Invasion of Land use from 2005-2016

By 2005-2016, the environmental consequence of rapidly increasing growth in Dadin Kowa has attracted a great deal of attention to planners, city administrators and urban geographers. This increase has resulted from the rapidly increasing population and socio-economic activities. Many people have to be housed, and so this brings about the conversion of 360.183 ha of agricultural and 9.163 ha of forest lands into urban uses (see Figure 4 and table 1). Sprawling has resulted from the fact that residential landowners discovered that they could make quick returns from investing in urban uses than agriculture and forestry. The movement of old and new resident continued into the study area which spreads out into Kianga, New Abuja, Barkin Akawo. Over 69% of residents are non-indigenes the Ibos, Yoruba, Hausa, Edo, Delta, Benue and so on while 31% comprises of the indigene plateau tribes of Birom, Angas and other minorities. The increase in population brought about high demand for reservoirs and pound for domestic activities (see Table1).

The trends in LULC successions/invasion and their changes for the period of 54years went through 34 different variables of change, mainly as a result of pressure from the ever growing population and its associated problems such as the increasing demand for land and trees for firewood, poor institutional and socio-economic settings, unfavorable government policies such as lack of control of tenure system and poor infrastructural development.

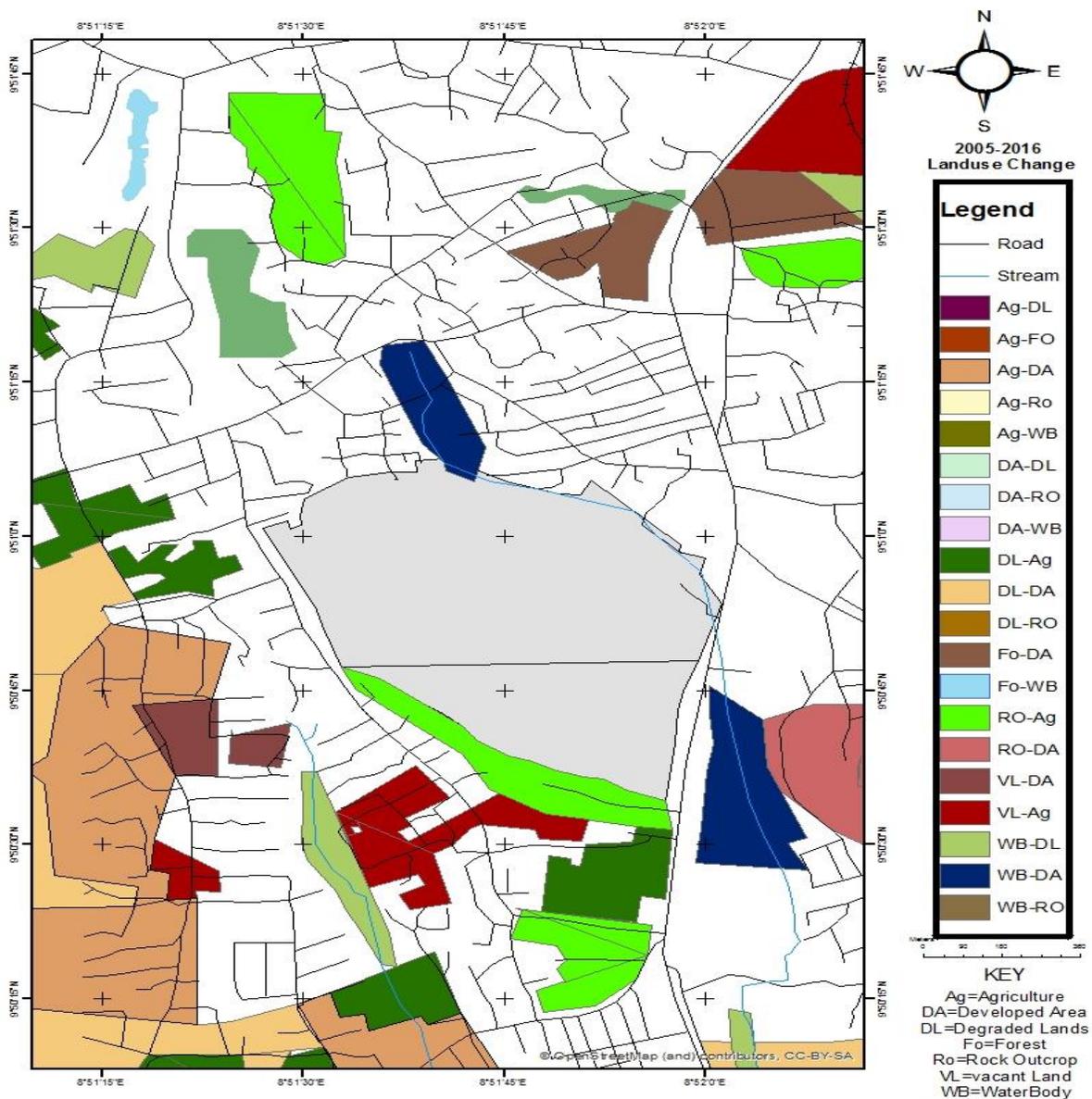


Figure 4: Trends of evasion and succession of land uses/cover change from 2005-2016.

It is observed that due to the improvement of infrastructures, the growth of Dadin Kowa moved from the North towards the North Southern part of the area shown in Figures 1, 2, 3 and 4. The southern part of Dadin Kowa is characterized by steep-sided slopes and a mountainous terrain which constrained the expansion of land use. Analysis of the LULC indicates urban growth expanded outwards into the rural-urban fringe around Barkin Akawo, Angwan Baki, Kangana and New Abuja. The results in Table 1, shows that between 1962 and 1971 (a total of 103.75ha of the LULC change was detected, with 48.233ha of succession and invasion. 18 of the 34 variable did not experience invasion and succession change., variables such as the changes from from Agriculture to Vacant land, Developed areas to Rock outcrop, Developed areas to Vacant Land, Developed areas to Waterbody and so on. The changes between 1971 and 1991 increased to a total of 397.61ha, with invasion/succession rate at 227.487ha. 8 variables did not experience change while 26

variables out of 34 variables experienced invasion/succession changes. For 1991 to 2005 the total LU changed increased with a difference of 74.8ha from those of 1971-91, making a total of 472.41ha with a total extent of 257.313 ha of succession and invasion. 12 variables did not change in their uses (see Table 1). It is reasonable to argue that there has been a relative change in the continuous and discontinuous fragmentation and spatial distributions of these LULC categories for the study area.

The result of change detection in LULC of the study area shows that for the period of 54 years, the LU dynamics for the degraded land has decreased from 14.98ha in 1962-71 to 2.976ha in 1971-91. The Built up (developed) areas change for 1962-1971 and 1971-1991 at an estimated increase from 13.07ha to 175.725ha as shown in Table 1 and Figures 1 and 2. The change in Agriculture between 1962-1971 and 1971-1991 indicates a decrease in the available cultivable land (Figure 1 and 2). Regarding the area distribution of other LU categories and their dynamics, it was found out that water bodies (Reservoirs, Ponds,

Stream) increase from 0.25ha in 1962-71 to 1.89ha in 1971-91, it then decreased to 0.47ha in 1991-2005 and then increased to 1.881ha in 2005-16 in Table 1 and Figures 1, 2, 3 and 4. This may be attributed to the global climate change phenomena, as climate at Polar regions are experiencing high temperatures which bring about snow melting and rainfall which flows through the temperature region down the tropics of which Jos is a part. Forest land, Agricultural lands and Rock Outcrop experienced some levels of change in their sizes due to the population explosion. Considering the above LULC change detection of the study area, it is noted with keen interest that activities such as mining and scarification have led to an increase in wastelands. Lands categorized as agricultural lands are lost to development. This is to say that, the percentage change in the proportion of various LU for the five decades shows an increase in developed area, water bodies and the disappearance of Vacant areas and a decrease in an agricultural land, forest land and rock outcrop in their changes (see Table 1 and Figures 1, 2, 3 and 4).

VII. CONCLUSION

The Argument of Mckenzie (1924), and Weinstein (2007) application of the theory in the study of Coney Island and neighbourhood and its results and findings supports the arguments that invasion leads to changes in land value and that invasion does not necessarily lead to succession. And that one important condition that initiates invasions is the sudden demand for special real estate sites. McKenzie also noted that "resistance to invasion" depends on the "type of Invader" and the Solidarity of Present occupants" This also is true for Dadin Kowa community as observed in the rise in value of land for Built-up/developed areas because of sudden increase of population mobility in search of security for their life and property as seen in the increase rent-age and scale of plot size, with development sprawling into the suburbs and merging up with other neighbouring community but not showing any evidence of change within the type of development aside residential use. It is obvious that Dadin Kowa has sprawled considerably over the years.

VIII. RECOMMENDATIONS

The trend in land cover change derived from this study on Dadin Kowa has shed more light on its spatial structure which is of paramount importance to urban development effort. To facilitate for proper planning and motivation of change, the following recommendations are made:

For Planners and policymakers to achieve effective spatial planning and management in towns and cities data on LULC change must be adequately available. This can be done using Geospatial techniques as exhibited in this research. There should be restrictions of expansion of residential to unfertile uncultivable but suitable land so that fertile cultivable land could be conserved for agriculture. Depletion of natural resources disrupts natural processes in ways that often are irreversible over long periods of time. The loss of soil via erosion that occurs during agriculture and the loss of wetlands and their associated ecological processes and species are few examples. To prevent depletion; such resources at risk must first be determined. In most parts of the nation, large

areas of natural habitats are becoming less common as they are fragmented into smaller habitat patches suitable for fewer species. A useful management approach generally favours protecting large areas and smaller areas that are well-connected to other habitats. Human uses of the land should avoid structures and uses that might have a negative impact on other systems; at the very least, ways to compensate for those anticipated effects should be determined.

It is useful to look for opportunities to design land use to benefit or enhance the ecological attributes of a region. For example, parts of golf courses in cities can be designed to serve as wildlife habitat, or traffic in rural areas can be concentrated on fewer and more strategically placed roads, resulting in decreased traffic volumes and lastly Implementing land-use and -management practices that are compatible with the natural potential of the area requires that land managers have an understanding of the site potential.

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The impact of COVID-19 in the state of Mississippi

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DOI: 10.29322/IJSRP.10.09.2020.p10593

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10593>

Abstract- Since the outbreak of Coronavirus disease (COVID-19) in late 2019, it has become a global pandemic, with severe impact on health and economy. The increasing prevalence of COVID-19 cases and the deaths in the United States (US) indicates a lack of compliance with the national and state guidelines by the Centers for Disease Control and Prevention (CDC). Mississippi (MS) has one of the highest number of cases and deaths than the national U.S average. This study reveals the risks and burden of COVID-19 in MS when compared to the US national average and proposes strict preventive measures to reduce the spread of Covid-19 in the state of Mississippi. This could be achieved through social distancing, use of face coverings, proper hand hygiene, virtual learning, decentralized contact tracing, and a probable second lockdown.

Index Terms- COVID-19, SARS-CoV-2, Pandemic, Infection, Mississippi.

I. INTRODUCTION

COVID-19 is an infectious disease that is caused by the newly discovered Coronavirus: Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) [1]. The COVID-19 outbreak first started in 2019, in Wuhan, China and has since become a global pandemic [1]. Individuals could become directly infected through respiratory droplets between person-to-person and indirectly through contaminated hard surfaces [2]. The symptoms of COVID-19 include weakness, cough, fever or chills, myalgia, new loss of taste or smell, nausea or vomiting, difficulty breathing, headache, diarrhea, sore throat, and runny nose [3]. Although these symptoms may appear 2-14 days after an individual is exposed to the virus, it is worth noting that some cases present without showing any symptoms [3], [4].

COVID-19 affects people of all ages [5]. However, the severity of illness increases with age and the presence of underlying conditions such as type 2 diabetes mellitus (T2DM), obesity, cancer, sickle cell disease, asthma, severe heart conditions, chronic obstructive pulmonary diseases (COPD), and chronic kidney diseases [5], [6]. While children rarely suffer from complications of COVID-19, a 90% increase in cases involving children has been reported by the American Academy of Pediatrics [7]. Conversely, adults experience COVID-19-related complications such as cerebrovascular accident, acute respiratory Distress Syndrome, pulmonary embolism, myocardial infarctions, cardiac arrest, and death [8]-[10]. The CDC

guidelines on the Covid-19 prevention and control measures include frequent hand hygiene, wearing a mask when around other people, keeping six feet distance from others, cleaning and disinfecting surfaces, and most importantly isolating in the presence of symptoms or exposure to SARS-CoV-2 [2], [11].

In the United States (US), the social inequities that have historically affected individuals from ethnic and racial minority groups have contributed to increased risks of becoming infected with COVID-19 among members of these groups [12]. The CDC data revealed that when compared with whites, black people were 2.1 times more likely to die from COVID-19, followed by indigenous people (1.4 times), and Latinos (1.1 times) [13]. Similarly, data from COVID Racial Data Tracker revealed that death caused by COVID-19 is higher in black people (81 per 100,000) than in Hispanic or Latino (46 per 100,000), American Indian or Alaska Native (44 per 100,000), White people (32 per 100,000), and Native Hawaiian and Pacific Islander (32 per 100,000) [14].

Mississippi (MS) has continued to report high number of new cases which poses a public health problem especially as it relates to its population and available resource [13]. The state's initial response to COVID-19 was a shelter-in-place order that required closing all schools and non-essential businesses [15]. Eventually, reopening plans such as sanitation guidelines, statewide mandatory face covering, strict social distancing, and limiting in-door gathering to ten people were set in place [15]. Despite having a reopening plan, the state continues to record high number of new cases and deaths after resumption which could be a resultant effect of non-compliance with CDC guidelines [13]. In spite of the urgent need for prompt healthcare actions, the Mississippi State Department of Health (MSDH) and the government still face challenges such as inadequate number of contact tracers, lack of funding, time lags between testing and result, and incomplete contact information of tested individuals [16]. With a state population of 2,976,149 and a total of 904 Intensive Care Unit (ICU) beds in the entire state, shortage of bed could be imminent if cases continue to rise [17], [18]. Experts have estimated a loss of \$7.9 trillion and \$6.6 billion on the US and MS economy, respectively [18], [19]. The

purpose of this paper was to elucidate the number of cases and death rates associated with Covid-19 in all the counties in Mississippi

II. MISSISSIPPI COVID-19 DATA

Over a period of three months, the MSDH has reported 70,665 new COVID-19 cases and 1,615 deaths bringing the total number of cases and death to 71,755 and 2,080, respectively [21]. To understand the burden of the increasing cases and deaths in MS, it is important to compare Covid-19 cases and death rates among the US and MS population. The ratio of new cases associated with Covid-19 between US and MS was 85:1 [13], [21]. It means that for every 85 new cases in the US there is 1 new case in MS [13], [21]. Additionally, the total number of cases in MS was 2,124 per 100,000 population while US reported 1,465 per 100,000 population [13]. This reveals higher rates of COVID-19 infection in MS when compared to the US and emphasizes the increased risks and burden in MS.

Importantly, the number of MS COVID-19 cases among Blacks are higher when compared to Whites [21]. The MSDH record showed that out of the total number of COVID-19 cases, 53.0% were non-Hispanic Black, 38.5% were Non-Hispanic Whites, 5.2% were Hispanics, 1.8% were others, 1.1% were Non-Hispanic American Indian or Alaska native, and 0.4% were Asians [21]. Similarly, out of all the COVID-19 related deaths 50.8% were non-Hispanic Blacks, 43.2% were non-Hispanic whites, 3.7% were Non-Hispanic American or Alaska Native, 1.6% were Hispanics, and 0.6% were others [21]. Gender has been found to influence the disease distribution as females (57.1%) were at higher risk of becoming infected than males (42.4%) and unknown (0.5%) [21].

The high rate of COVID-19 and poorer outcomes among racial and ethnic minorities occur as a result of disparity in access to social determinants of health such as quality education, health care services, good job opportunities, safe housing, and healthy foods [22], [23]. Racial and ethnic minority groups are more likely to be uninsured, live in overcrowded houses, and work in a high risk Covid-19 environment than non-Hispanic whites [22], [24], [25].

Table 1. COVID-19 Cases and Deaths by County level in Mississippi [21].

County	Total Cases	Total Deaths
Hinds	5878	128
De Soto	3888	34
Harrison	2755	37
Madison	2538	74
Jackson	2449	47
Rankin	2411	41
Jones	1978	64
Forrest	1905	57

Washington	1811	46
Lee	1700	43
Lauderdale	1488	98
Neshoba	1328	96
Lamar	1284	19
Bolivar	1219	40
Warren	1173	37
Oktibbeha	1171	41
Panola	1139	18
Lowndes	1136	42
Sunflower	1106	29
Lafayette	1062	21
Scott	1029	21
Copiah	986	30
Pike	977	38
Leflore	976	70
Holmes	945	50
Yazoo	887	14
Pontotoc	884	9
Lincoln	871	44
Monroe	868	55
Grenada	866	27
Simpson	852	36
Coahoma	812	13
Leake	811	27
Wayne	808	21
Tate	768	30
Marshall	766	10
Union	761	19
Marion	707	21
Adams	664	28
Covington	656	16
Winston	652	18
George	637	9
Pearl River	596	41
Newton	587	12
Tallahatchie	565	11
Attala	549	25
Walthall	525	22
Chickasaw	508	19
Prentiss	497	11
Noxubee	482	12
Tishomingo	467	12
Alcorn	451	5
Tippah	434	14
Calhoun	433	9
Jasper	424	11

Hancock	422	15
Itawamba	422	10
Smith	421	13
Clay	417	14
Claiborne	414	14
Tunica	375	8
Clarke	368	28
Montgomery	365	10
Lawrence	341	8
Yalobusha	324	10
Humphreys	310	12
Quitman	278	1
Greene	275	13
Carroll	265	11
Webster	257	13
Perry	256	8
Jefferson	253	6
Davis	253	6
Stone	249	6
Kemper	248	14
Amite	246	6
Wilkinson	233	14
Sharkey	215	7
Jefferson	198	8
Benton	165	1
Franklin	150	2
Choctaw	141	4
Issaquena	27	2
Total	71,755	2,080

The Mississippi Department of Health (MSDH), 2020

Table 1 shows the number of COVID-19 cases and deaths by county level, with Hinds recording the highest number (cases, 5878 vs deaths, 128), Issaquena has the lowest number of cases (cases, 27 vs death, 2) and Benton (cases, 165 vs deaths, 1) [21]. Hinds (5878 cases) is followed by De Soto (3888), Harrison (2755), Madison (2538), Jackson (2449), Rankin (2411), Jones (1978), Forrest (1905), Washington (1811), Lee (1700), Lauderdale (1488), Neshoba (1328), Bolivar (1219), Warren (1173), Oktibbeha (1171), Panola(1139), Lowndes(1136), Sunflower (1106), Lafayette (1062), and Scott (1029) [21]. In contrast, counties like Copiah, Pike, Leflore, Holmes, Yazoo, Pontotoc, Lincoln, Monroe, Grenada, Simpson, Coahoma, Leake, Wayne, Tate, Marshall, Union, Marion, Adams, Covington, Winston, George, Pearl River, Newton, Tallahatchie, Attala, Walthall, Chickasaw, Prentiss, Noxubee, Tishomingo, Alcorn, Tippah, Calhoun, Jasper, Hancock, Itawamba, Smith, Clay, Claiborne, Tunica, Clarke, Montgomery, Lawrence, Yalobusha, Humphreys, Quitman, Greene, Carroll, Webster, Perry, Jefferson Davis, Stone, Kemper, Amite, Wilkinson, Sharkey, Jefferson, Benton, Franklin, Choctaw, and Issaquena have recorded less than 1000 cases each [21]. Counties that have recorded 50 deaths

and above include Hinds (128), Lauderdale (98), Neshoba (96), Madison (74), Leflore (70), Jones (64), Forrest (57), Monroe (55), and Holmes (50) [21]. Taking prompt public health actions in all these counties could lead to significant reduction in the spread and death associated with SARS-CoV-2.

III. DISCUSSION

In just three months, MS has recorded over 100% increase in new COVID-19 cases which escalated from 1,090 to 71,755 [21], [26]. This could be partly due to the high prevalence of chronic diseases (diabetes mellitus, cancer, lung diseases) among racial and ethnic minority groups [27]. According to CDC, people with hypertension, obesity (BMI ≥ 30), or diabetes were three times more likely to become hospitalized if they became infected with SARS-CoV-2 [28]. Similarly, people with asthma (1.5 times), chronic kidney disease (4 times), and severe obesity (BMI ≥ 40 [4.5 times]) experience higher COVID-19 related hospitalization than people without these conditions [28]. Besides, poor social determinants of health (low income, unhealthy lifestyle, substandard education) can contribute to the prevalence of COVID-19 among racial and ethnic minority groups [22]. With the high number of COVID-19 cases in MS, hospitalization into ICUs and Medical/surgical units have steadily increased leaving only 17% of ICU beds and 30% of Medical/Surgical unit beds available [18]. Despite the State Health Officer's warning on the likelihood of hospitals going beyond capacity, some people continue to ignore the public health guidelines (face covering, social distancing, hand hygiene) [29]. This strongly suggests that the healthcare system will soon experience an overwhelming increase in COVID-19 cases which could aggravate the existing burden of this virus on the state [29].

IV. CONCLUSION

In order to minimize severe outcome of COVID-19, the existing guidelines for prevention and control such as proper hand hygiene, mandatory face covering, social distancing, safe public gathering, and plans for reopening of schools and businesses should be maintained [30]. Since COVID-19 pandemic is an emerging situation, strict implementation of measures based on new findings could be beneficial in reducing the spread of SARS-CoV-2. More importantly, MS should consider using California's approach to education by making all classes virtual [31]. Furthermore, as some states such as California have already done, contact tracing should be decentralized to involve both the local and state health departments and possibly contract it out to a privately-owned company [32]. Lastly, more stringent measures such as statewide lockdown should be enforced until there is a significant reduction in number of cases [29].

COVID-19 cases will reduce if there is increased compliance with the CDC's guidelines on prevention and control of SARS-CoV-2. Face coverings and social distancing should be maintained while virtual learning and strict contact tracing

should be implemented. Strict actions may be more efficient in reducing the spread of SARS-CoV-2.

ACKNOWLEDGMENT

Nneka Rogers, Jamie Hamil

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The Effectiveness Of Using Virtual Laboratory On Practical Skills The Unit Operation Subject Student Of Chemical Engineering

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DOI: 10.29322/IJSRP.10.09.2020.p10594

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10594>

Abstract- This research was conducted to determine the ability of students to understand and apply practical skills in the Unit Operation laboratory of Chemical Engineering. Practice at the laboratory is carried out as a condition for students to study the Unit Operations courses. The assessment of practical skills is focused on psychomotor abilities and data analysis from experiments conducted by students. Do practice at the laboratory is carried out so that students can better understand the theories given during lectures. However, several obstacles cause students to be less able to understand the process contained in the experiment, because students do not understand clearly how the tools used in the laboratory, the following functions, and uses. To overcome this obstacle, this research uses technological assistance in the form of a virtual laboratory. The use of virtual laboratories in this study aims to analyze the effectiveness of practical skills in unit operation subjects. The virtual laboratory is used by students before conducting a real experiment (Hands-on Laboratory). This research uses quantitative methods with a quasi-experimental type of research. Which divides the two groups into an experimental group and a control group. From the results of the research that has been done, it is found that the use of virtual laboratories is effective in increasing the ability and practical skills of students. The virtual laboratory is very helpful for students to be able to imagine the working process of tools and experimental procedures in the laboratory.

Index Terms- virtual laboratory, practical skills, the unit operations, chemical engineering

I. INTRODUCTION

The main problem in engineering education is the lack of maximum scientific and mechanical knowledge of students and educators. The technical equipment used in the application of science has a variety of specifications, so it is necessary to understand in-depth concepts for students who study education in engineering. The right learning strategy is needed to solve learning problems in engineering. Learning problems not only arise due to students not understanding the technical-scientific concepts, but also the lack of maximum understanding of the equipment and working procedures of technical tools.

To overcome the learning problems that require visual learning, learning is developed using virtual reality. Although in the beginning the use of virtual reality was limited to the military, in subsequent developments learning using this strategy was developed in formal education. Virtual reality is used to help visualize learning. This is done to make it easier for students to understand the material or concept given. With this strategy learning that does not seem real will be easier to understand. For example, learning about how the pump works. Students will experience some obstacles in understanding how the pump works, because they do not know the devices inside the pump and how the pumping process occurs. But using animation or virtual, it can be explained in detail how the inlet and outlet procedures, as well as the pump compiler, without having to disassemble the pump-because dismantling the pump creates the risk of fatal damage and a quite expensive financing.

Virtual learning can also help students to be better prepared when entering the workforce. Especially in the engineering field, it needs workers who can operate the tools and understand how to work the industrial tools appropriately. Also, students must be able to be highly competitive with other students in the context of learning, research, and development in the community.

In the field of chemical engineering research, the virtual laboratory is implemented in the form of virtual reality. The virtual laboratory used to help clarify tools and experiments in learning. This equipment help students can conduct experimental procedures properly and correctly. The virtual laboratory is also used to clarify the work processes of technical equipment and industrial processes on a laboratory scale. This research was conducted to analyze the student's abilities and student's practical skills. The

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10594>

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supporting facility in the learning process of this practicum is a virtual laboratory for Unit Operation of Chemical Engineering courses that can be used by students independently or with direction to maximize comprehension skills. Another goal of this study is to maximize the ability to use the virtual laboratory in the learning process, to improve the ability of individual students, to improve the cognitive abilities of students, to improve the psychomotor abilities of students in carrying out practicum manually in the laboratory and to improve the effectiveness and efficiency of the process learning. From this explanation, the researcher wants to formulate a research problem, the effective use of a virtual laboratory on the practical skills of the Unit Operations course.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

Virtual Laboratory (VRL)

A laboratory is a place that is used to conduct experiments and training related to physics, biology, and chemistry, or other fields of science, which is a closed room or open space such as gardens and others. The activities carried out in the laboratory are practicum activities.

In carrying out practical activities required the ability to perform practical skills. Aspects that affect practicum skills are not only cognitive aspects, but psychomotor aspects can also play a maximal role. The things done in conducting practicum activities are preparation in learning practicum material, ability to master tools in the laboratory, mastering the steps involved must be carried out during the process of practicum activities, can make a written report on the results of trials in the laboratory.

Virtual Laboratory (VRL) is a software device that is designed to perform repeated experiments on a variable (Toth, 2016). VRL is a medium used to help understand a subject and can provide solutions due to the limitations or absence of laboratory equipment. A virtual laboratory is defined as an interactive environment for creating and conducting simulation experiments: a playground for experimenting.

VRL or virtual laboratory is a technology-based laboratory that is expected to be able to help problems in science learning that many use conventional laboratories and incur a high enough cost. Basically, researchers conducted this research to develop technology-based laboratories without completely eliminating the use of real laboratories. Learning in a laboratory where group learning provides better knowledge (Belanger, 2016). Learning in the laboratory can help students to better understand and understand, especially for learning science, engineering, computers, and so forth. The use of virtual laboratories in several different fields shows the results that there is greater interest in fields that use virtual technology (Alkhaldi, Pranata, & Athauda, 2016).

In implementing the learning strategy using VRL, educators provide direction in the use of virtual laboratories. The direction or guidance provided can be in the form of interactions in the classroom online or offline and the provision of correct work procedures. VRL can be used by students if the university experiences equipment and material constraints as well as teaching staff, so that learning objectives are still achieved despite obstacles. Virtual laboratories are used to help finalize concepts and help students with limited abilities without limiting them to scientific learning that attracts students, as well as helping the learning process become smoother with the time needed more efficiently. Besides the time needed to be more efficient, the need for practicum funding tends to be quite high. Because practicum is done repeatedly, so throw a lot of material in the experiment. If it is started by using a virtual laboratory, it is hoped that students will already simulate the experiments that will be carried out in practicum, thereby minimizing the use of excessive materials. The effective use of visual aids exhibited using a virtual laboratory compared to those not using a virtual laboratory. And the result is the use of virtual laboratories can improve the effectiveness of learning chemistry (Grmek, 2014). The use of virtual laboratories produces students who have a higher interest in learning (Pyatt & Sims, 2012). Use of virtual laboratories as laboratory applications in an interactive constructivist learning environment. The results show that chemical laboratory software is as effective as real chemistry laboratories and positively influences the facilitation of the environment (Tatli & Ayas, 2012).

Practical Skills

Practical skills are one of the psychomotor aspects that must be possessed by every student who manages courses with practicum. Assessment of the ability to do practical work in the laboratory by students is not only obtained from a cognitive assessment. The basis for assessing and analyzing practical skills is to use Bloom's taxonomy. Taxonomy comes from two Greek words tassein which means classifying and nomos which means the rule. Taxonomy means a classification hierarchy of basic principles or rules. The term is then used by Benjamin Samuel Bloom, a psychologist in education who conducts research and development on thinking skills in the learning process. Bloom's taxonomic history began when in the early 1950s, at the Conference of the American Psychologists Association, Bloom and colleagues suggested that from the evaluation of learning outcomes that were mostly compiled in schools, it turned out that the largest percentage of items raised only asked students to their memorization. The conference was a continuation of the conference held in 1948. According to Bloom, memorization is the lowest level of thinking ability (thinking behavior). There are still many other higher levels that must be achieved so that the learning process can produce students who are competent in their fields. Finally in 1956, Bloom, Englehart, Furst, Hill, and Krathwohl succeeded in introducing the concept of thinking skills called Taxonomy Bloom (Bloom's Taxonomy for E-Learning Compiled by Khan, n.d.).

Bloom's Taxonomy is a hierarchical structure that identifies skills arranging from low to high levels. To achieve higher goals, low levels must be fulfilled first. The educational concept goal by Bloom is classified into three domains of intellectual cognitive, affective, and psychomotor. Bloom's Taxonomy has encountered two changes, namely, the Bloom Taxonomy and the Taxonomy which has been developed by Anderson and Krathwohl. For each discussion explained as follows, Cognitive Domains Cognitive goals

or cognitive domains are those that include mental (brain) activities. According to Bloom, all efforts concerning brain activity are included in the cognitive realm.

Cognitive domain

In the cognitive domain, there are six levels of thought processes, ranging from the lowest level to the highest level which includes 6 levels including Knowledge (C1), Comprehension (C2), Application (C3), Analysis (C4), Synthesis (C5), and Evaluation (C6).

Affective Domain

The Affective Domain covers everything related to emotions, such as feelings, values, appreciation, enthusiasm, interests, motivation, and attitudes. These five categories are sorted from simple to most complex behaviors, namely Receiving - A1, Responsive (A2), Value, A3, A3, Organization A4, Characterization - A5

Psychomotor domains

Psychomotor domains include physical movement and coordination, motor skills, and physical abilities. These skills can be honed if they do so frequently. These developments can be measured in angles of speed, accuracy, distance, method/technique of implementation. There are seven categories in the psychomotor domain ranging from simple levels to complicated levels namely Impersonation - P1, Manipulation - P2, Resolution - P3, Articulation - P4, Experience - P5 According to the behavior displayed with the least amount of physical and psychological energy. The movements are carried out routinely. Experience is the highest level of ability in the psychomotor domain.

The Unit Operation

The unit operation course is a branch of engineering that studies the processing of raw materials into more useful goods, which can be either finished goods or semi-finished goods. Chemical engineering is applied primarily in the design and maintenance of chemical processes, both on a small scale and a large scale such as factories. Chemical engineering first appeared in the development of operating units, one of the basic concepts of modern chemical engineering now (McCabe, Warren L, Smith, J., Harriot, 1993). Chemical Engineering Operations is one of the mandatory courses in Chemical Engineering study programs. Chemical Engineering Operations or also known as unit operations is a basic stage in a process. The operating unit not only changes a substance such as a reaction in a chemical reactor but also physical and phase changes such as separation, crystallization, evaporation, filtration, and several other examples. For example in milk processing, homogenization, pasteurization, cooling, and packaging, each is an operating unit that is related to produce the whole process. A process can consist of many operating units to get the desired product.

Chemical Engineering Operations course is divided into 3 parts, namely Chemical Engineering Operations 1, Chemical Engineering Operations 2, and Chemical Engineering Operations 3. In general Chemical Engineering Operations studies the unit of operation in a process. Chemical Engineering Operations Course 1 studies fluid flow through pipes, fluid measurement, fluid transportation equipment, stirring and mixing, flow through immersed objects, stationary and fluidized beds, mechanical-physical separation, reduction of solid particles, and solid-solid mixing. Chemical Engineering Operations Course 2 studies the understanding of the operation of process equipment based on heat and mass transfer namely evaporation, humidification, drying, and crystallization. Chemical Engineering Operations course 3 studies the theory of separation operations, especially absorbs, distillation, leaching, extraction, and determining the basic specifications of the separation process equipment with stage-wise and packing.

Practicum in the chemical engineering department is given at low to high difficulty levels. Some of the practicums given were Basic Chemistry practicum, Chemistry Analysis practicum and Microbiology practicum in semester 2, Organic Chemistry practicum and Physical Chemistry practicum, and Chemical Engineering Operations 1 practicum in semester 3 and Chemical Engineering Operations 2 in semester 4. Practicum material given is adjusted to the learning material of each course. For the Chemical Engineering Operations 1 course, there are several practical materials, namely fluid mechanics, fluid flow, piping, piping design, solid-solid separation, sedimentation, and water treatment.

III. RESEARCH METHODOLOGY

This research uses quantitative methods with a quasi-experimental type of research. This experiment was chosen because the study did not use random, so there are two groups of subjects that have been available as is, the experimental group and the control group have been determined not chosen randomly or randomly (Setyosari, 2015). Design or research design using a pretest-posttest control group design. An experimental group is a group of students who do practical work with the help of the Virtual Laboratory, while the control group is a group This research will be conducted quantitatively on Chemical Engineering study program students as research objects because the use of virtual laboratories is very following the situation of learners and self-regulated learning is more effectively developed for students who are already adults (students). Quantitative research is carried out to calculate and infer the results of research from the sampling used. Experiments carried out for 1 semester (16 meetings or approximately 6 months) during the learning process and practicum takes place. The study was conducted at Tribhuwana Tunggal University in the Chemical Engineering study program at the Strata-1 Engineering Faculty. Each class contains approximately 30 to 33 students with practicum groups of each group of 5-6 people. The data analysis process is used to answer the research problem formulation. Testing the hypothesis presented in chapter I will be analyzed by using the Multivariate Analysis of Variance (MANOVA) technique using SPSS 22. The Manova Test is a Multivariate Path Analysis Test. In Manova there is more than one dependent variable. The independent variable in this study is the virtual laboratory, the independent variable is the learning outcomes and practical skills.

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<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10594>

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Research result

In this study, there are 2 groups, namely the experimental group and the control group. The experimental group consisted of 36 students and the control group consisted of 33 students. The experimental group uses the virtual laboratory in the learning process, while the control group uses hands-on laboratory or direct learning.

Between-Subjects Factors

		Value Label	N
Strategy	1	VRLs	36
	2	HOLs	33
SRL	1	High	40
	2	Low	29

From the data results, it can be seen that students who use the virtual laboratory have higher average practical skills than students who use the Hands-on Laboratory strategy

Practical Skills

Tests of Between-Subjects Effects

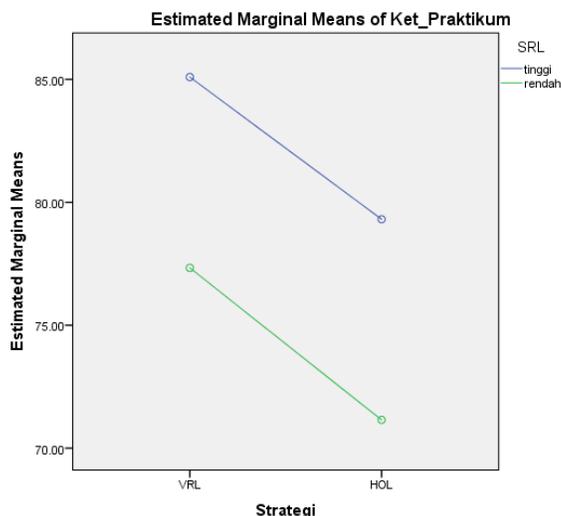
Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	Hasil_Belajar	1431.735 ^a	3	477.245	23.256	.000	.518
	Ket_Praktikum	1686.390 ^b	3	562.130	20.148	.000	.482
Intercept	Hasil_Belajar	393625.905	1	393625.905	19180.999	.000	.997
	Ket_Praktikum	410745.903	1	410745.903	14722.110	.000	.996
Strategi	Hasil_Belajar	338.692	1	338.692	16.504	.000	.202
	Ket_Praktikum	600.951	1	600.951	21.540	.000	.249
SRL	Hasil_Belajar	1077.396	1	1077.396	52.500	.000	.447
	Ket_Praktikum	1063.680	1	1063.680	38.125	.000	.370
Strategi * SRL	Hasil_Belajar	.286	1	.286	.014	.906	.000
	Ket_Praktikum	.667	1	.667	.024	.878	.000
Error	Hasil_Belajar	1333.908	65	20.522			
	Ket_Praktikum	1813.496	65	27.900			
Total	Hasil_Belajar	415168.880	69				
	Ket_Praktikum	433970.900	69				
Corrected Total	Hasil_Belajar	2765.643	68				
	Ket_Praktikum	3499.886	68				

a. R Squared = .518 (Adjusted R Squared = .495)

b. R Squared = .482 (Adjusted R Squared = .458)

Dari table diatas maka dapat diambil kesimpulan, bahwa ketrampilan praktikum dipegaruhi oleh

From the table behind, we have conclusion about the research. The number of Signification from practical skills show that sig. 0.000 < 0.05 means practical skills have influenced by Self-Regulated Learning. And sig. 0.878 > 0.05 shows that practical skills have interaction between Self-Regulated Learning and Learning Strategic.



Estimated Marginal Means from Practical Skills

From data. obtained 2 plot lines the effect of the Strategy on practicum skills. There is no intersection between the two VRL and HOL plots. If you pay attention from the plot, the results are obtained, that students who use the VRL strategy have higher practical skills than students who use HOL.

ACKNOWLEDGE

The authors wish to thank Chemical Engineering Departement University of Tribhuwana Tungadewi for support the research. Thanks to all students, lecture and all staff for their co-operation, for their help and support during the period of this research.

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Characteristics of Market Solid Waste in Akure, Ondo State, Nigeria

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DOI: 10.29322/IJSRP.10.09.2020.p10595

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10595>

Abstract- The patterns of solid waste generation, collection, disposal and treatment in Oja Oba and Odopetu markets in Akure South local government area in Akure, Ondo State, Nigeria has been investigated. This was to determine the efficiency of waste management in the markets. A descriptive cross-sectional method was used to collect information from shop owners on waste generation, storage disposal, and treatment. The instrument adopted for the study was a structured questionnaire administered to randomly selected 419 and 16 shop owners from Oja Oba and Odopetu respectively. The study population reflected the sizes of the markets. Three pre-labelled polythene bags were assigned to each participant with an instruction on how to keep different types of waste. The bags were retrieved three times a week (Monday, Wednesday and Friday) for six weeks, sorted, counted (where possible) and weighed to determine the type, number and quantity of waste generated. Data obtained were analysed using appropriate statistical methods. Results obtained revealed that on the order of number of waste types collected was polythene > paper/carton > plastics > glass/electrical/electronics in Oja Oba and paper > polythene > plastics > glass/electrical/electronics in Odopetu market. For waste weight the order was glass/metal/electrical/electronic > putrescible > plastic > paper > polythene in Oja Oba and putrescible > plastic > polythene > paper in Odopetu. There is no management structure in Odopetu but although there is a waste management authority in Oja Oba modern facilities were either lacking or inadequate. There was no time frame for waste evacuation in Odopetu but takes a week or more in Oja Oba. The study concluded that waste management was poor ineffective in both markets.

Index Terms- Solid waste, management, Oja Oba, Odopetu, Akure South, Nigeria

I. INTRODUCTION

Markets are authorized public concourse where buyers and sellers of commodities meet to browse the merchandise in search of what best to spend money on (Benova *et al.*, 2014). As an indispensable medium for chain commodity distribution, they play very vital roles in the economic life of individuals and communities. Besides, markets strengthen the economic base of towns and also sustain the tax base of local authorities (Ojo, 2008; Okemakinde, 2016). They also provide platforms for social interaction among people of diverse cultures, socio-economic backgrounds and sellers and buyers of diverse goods (Vargo and Lusch, 2008). Activities in some of these markets take place daily

or at other regular intervals such as every four days or at most every week. Some of these activities involve processes that generate varying types and volumes of solid waste also of varying characteristics. The hygienic condition of markets usually depends on the framework established for the management of these waste in each market. Such frameworks are either weak or absent in several Nigerian markets and that is why the problem of solid waste management has remained a concern in all economic sectors of the country (Mbah and Nzeadibe, 2017). Abigo *et al.* (2016) observed that the solid waste challenges seen in the larger population also exist in most Nigeria markets. These challenges include but not limited to the inefficient collection methods, insufficient coverage of the collection system and improper disposal and treatment of waste. These inefficient management systems could lead to several unexpected consequences such as environmental pollution, blockage of drainage systems, unpleasant odours, flooding and health hazards. While efforts are being made at all levels of government to improve solid waste management, information is required from all sources to capture all affected areas particularly the markets where diverse and large bulk of waste is constantly generated (Ogwueleka, 2010). Information on the characteristics of waste in markets located in Akure, the capital of Ondo State is sparse, so are the systems employed by the market authorities to manage such wastes. This paper presents the findings of a study carried out to provide basic information on types of waste generated in some selected markets in the city, as well as the patterns of waste generation, disposal and treatment in each of the selected markets. This was with the view for providing information that could go a long way towards effective planning for a sustainable waste management in the markets.

II.

III. RESEARCH ELABORATIONS

The Study Area

Two markets (Oja-Oba and Odopetu) were selected for study in Akure, Akure South Local Government Area in Ondo State, Nigeria. Akure lies between Longitudes 007°5'-7°19'N and Latitudes 05°5'-5°20'E (Fig. 1). It is the administrative capital of Ondo State, comprises of two local government areas (Akure South and Akure North) and has a total population of 491,033 according to 2006 Census figures (Macaulay and Odiase, 2016). The population is predominantly of Yoruba ethnic group although

people of other ethnic groups in Nigeria such as Igbo, Hausa, Fulani etc. constitute more than 10%.

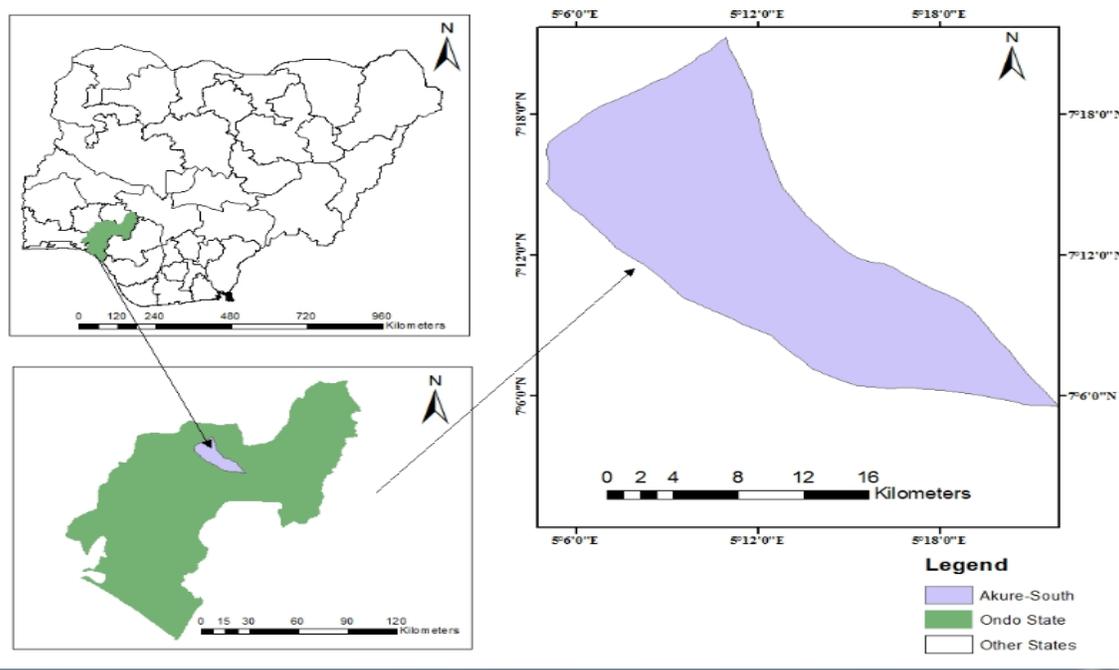


Figure 1: Map of Study Area Showing Sampling Points

Study Design and Data Collection

Two markets investigated were the smallest and biggest of 13 markets in the local government area (LGA). Both descriptive and cross-sectional study designs were utilized to collect mixed data (qualitative and quantitative) for the study. Instruments used to collect qualitative data were key informant interviews and structured questionnaires while weighing scales were used to weigh waste materials. Key informant interviews were conducted among key decision makers including (i) Heads of Sanitation and Primary Health Care Departments at the State Waste Management Board and the chairpersons of market associations. These respondents provided information on the patterns and methods of collecting solid waste in the markets, method of waste disposal as well as treatments of solid waste at the dump site. They also provided information on fees charged for services and penalties for defaults.

For the purpose of this study, each selected market was divided into sections based on predominant goods sold in different parts of the market. The sections were food stuff, clothes, provisions, kitchen utensils, among others. Inventory of stalls in each section was then undertaken and systematic sampling technique used to select stalls that participated in the study. All participating stalls met some pre-defined inclusive criteria. These were (i) that the current user of a selected stall must have been using the stall for at least 6 months prior to this study. (ii) that the said user accepts to be enrolled to the study and to keep waste in accordance with the study design (Francis *et al.*, 2016). A total of 440 stalls owners were enrolled for participation in the study. Pretested semi-structured questionnaire was administered to each participant. The questionnaire collected information on the respondent's bio-data, type and rate of waste generation, patterns of waste disposal as well as perception and acceptance of the activities of waste management authorities. Three polythene bags of standard waste colours were assigned to each participant with

an instruction on how to keep different types of waste in three categories of waste types. The categories were; Category "A" (Paper, plastic, tins, nylon, cloth and glass waste), Category "B" (Garbage, food waste, agricultural waste) and Category "C" (Electrical, electronic and battery waste). The bags were retrieved three times a week (Monday, Wednesday and Friday) for six weeks. At the point of retrieval, waste held by each bag was sorted, counted (where possible) and weighed to determine the type, number and quantity of waste generated.

Ethics and Consent to Participate

The ethical approval with number IPHOAU/12/853 was approved by the Ethical Committee of the Institute of Public Health of the Obafemi Awolowo University, Ile-Ife, Nigeria. Respondents' gave their consent freely and willingly after they were briefed about the purpose of the study and were informed that participation was voluntary and refusal to participate attracts no penalty. Personal identifiers were removed in the data to ensure confidentiality.

Statistical Analysis of Data

The study response rate was 98.9% and the outcome of the univariate responses were presented in frequency and percentages while the differences in group response to each question were evaluated using Chi-square test from the Contingency table. Chi-square was also used to assess differences in the number of waste generated by stalls and sectors in the study areas. Differences in mean weight of waste collected from different markets were determined using the t-test for variables with two levels, while One-way Analysis of variance (ONE WAY) was used analyse variable with more than two levels. All the decisions on the significance were made at p-value of 0.05 or less.

IV. RESULTS

Socio-Demographic Profile of the Respondents

A total of 440 stalls (one participant/stall) were selected out of which 435 (98.9%) that met all inclusive criteria participated. Table 1 presents the socio-demographic characteristics of the participants. Four hundred and nineteen (419) of the participants were selected from Oja-oba market and 16 from Odopetu market to reflect the proportionate size of the markets. Most of the participants were females 275 of 419 (65.6%) and 14 of 16 (87.5%) in Oja-Oba and Odopetu markets, respectively. Most respondents in Oja Oba were Christians (349, 83.3%) while majority in Odopetu were traditional worshippers. Most respondents in both markets were Yorubas (280, 66.8%; 14, 87.5%) and married (356, 85.0%; 15, 93.8). Furthermore, while slightly above a half (236, 56.3%) of respondents had a secondary education in Oja Oba, slightly above a third (6, 37.5%) in Odopetu had either had a primary or a secondary education. Their ages ranged from 20 to 70 years, though, the age group 31-40 years had the highest number of participants (201, 46.2%) while age group 20-30 years had the least number (25; 5.97%). Statistically, the age-distribution was significantly different ($p < 0.01$). Most of the respondents 418 (96.1%) had spent more than 5 years trading in the market by the time of this study. This is a clear indication that most participants have a good knowledge of the market. Statistically, only the distribution of gender, age and religion varied significantly in the two markets investigated.

Table I: Demographic Characteristics of Study Participants in Oja-Oba and Odopetu Markets, Akure

Parameter	Oja-Oba	Odopetu	Total
Gender			
Male	144	2	146
Female	275	14	289
χ^2 -value ($df= 1$)	3.88		
p-value	<05		
Age-group			
20-30	25	1	26
31-40	193	8	201

Respondents' Account of Waste Generation and Disposal in the Markets

The frequency of generating different types of solid waste according to the respondents in the markets is shown in Figure 2. Polythene waste was the most frequently generated in the two markets (65%) while can and bottles were the least (0.2%). The respondents reported sources of polythene waste to be disposed packages for food, water and other items. Over 90% of respondents in Oja Oba said the waste management authority collects their wastes either daily or weekly while in Odopetu all the respondents said they dispose their waste themselves because there is no waste management authority in the market. In Oja Oba about 48% of respondents said they do take their waste to collection centres while over 50% said waste management vehicles collect waste directly from their stalls. It was observed that waste was collected directly only from shops located on

41-50	152	4	156
50+	49	3	37
χ^2 -value ($df= 3$)	15.90		
p-value	<0.01		
Marital Status			
Single	57	1	58
Married	356	15	371
Widow/Widower	6	0	6
χ^2 -value ($df= 2$)	1.36		
p-value	>0.05		
Ethnic Group			
Yoruba	280	14	294
Hausa	11	-	11
Igbo	102	1	103
Others	26	1	27
χ^2 -value ($df=3$)	4.71		
p-value	>0.05		
Religion			
Christian	349	5	354
Muslim	68	4	72
Traditional	2	7	9
χ^2 -value ($df=2$)	44.13		
p-value	<001		
Educational Background			
None	11	3	14
Primary	91	6	97
Secondary	236	6	242
Tertiary	81	1	82
χ^2 -value ($df= 3$)	10.51		
p-value	>0.05		
Number of years spent in the market (years)			
1-2	7	0	7
3-4	10	0	10
5+	402	16	418
χ^2 -value ($df= 2$)	1.30		
p-value	>0.05		
Total	419	96.3	435

access roads in the market. On materials used to collect waste in shops, almost equal number of respondents in Oja Oba said they use either dustbin or sack while in Odopetu, more than four fifth said they use sack while less than a fifth (12.5%) use bin. The pattern of variation in all the variables was significantly different ($p < 0.05$) in both markets investigated. Almost 99% of respondents said that the final destination of waste they generated was the state dumpsite while slightly above 1% said they burn their waste.

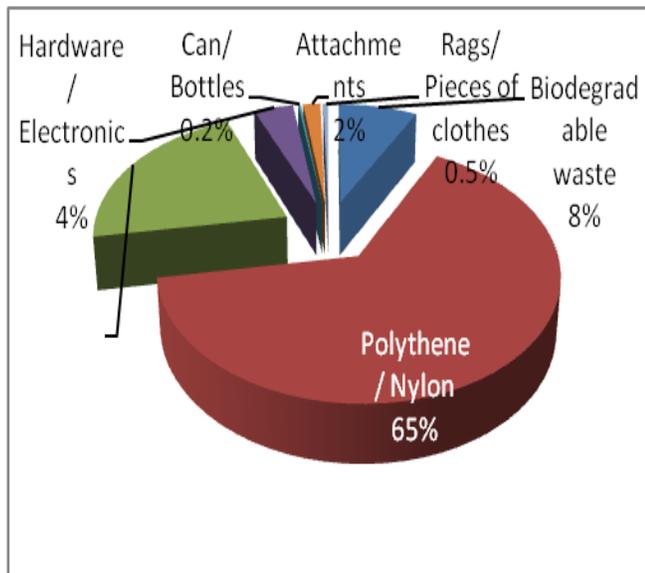


Figure 2: Components of Solid Waste Commonly Generated in the Study Area

The number and weight of major types of solid waste collected from the markets are presented in Table 4. On the basis of most countable, the order of occurrence of the waste collected was polythene > paper/carton > plastics > glass/electrical/electronics in Oja Oba and paper > polythene > plastics > glass/electrical/electronics in Odopetu market. The polythenes comprised mainly of nylon bags, disposed sachet water packages etc. The plastics were disposed buckets, jerricans, pipes, bottles and, basins of different sizes. The glass, metal, electric and electronic waste comprised of discarded bottles, glass wares, radios, cans, metal rods, pipes, wires and containers, telephones, batteries and touch lights. The waste weight was in the order glass/metal/electrical/electronic > putrescible > plastic > paper > polythene in Oja Oba while in Odopetu the order was putrescible >.plastic > polythene > paper. It was observed that most of the putrescible generated from the grocery section in Oja Oba were quickly collected by livestock managers to feed ruminant animals. Comparison of the two markets investigated showed that for each type of waste, more was significantly generated in Oja Oba than Odopetu both in terms of total number and weight as well as number and weight of each waste type per individual.

Table II: Generation, Collection and disposal of Waste in Oja-Oba and Odopetu Martkets, Akure

Parameter	Oja-Oba (%)	Odopetu (%)	Total (%)
Material used to collect waste in the stall			
Bin	209 (49.9)	2 (12.5)	211(48.5)
Sack	210 (50.1)	14 (87.5)	224(51.5)
χ^2 -value ($df= 1$)	7.19		
p-value	<05		
Frequency of waste disposal			
Daily	218 (52.0)	16 (100)	234 (53.8)
Weekly	200 (47.7)	0 (0)	200 (46.0)
Monthly	1 (0.2)	0 (0)	1 (0.2)
χ^2 -value ($df= 2$)	20.37		
p-value	<0.01		
Who disposes the waste			
Respondent	38 (9.1)	16 (100)	54 (12.4)
*MWMA	381 (90.9)	0 (0)	381 (87.6)
χ^2 -value ($df= 1$)	93.01		
p-value	<0.01		
Location of final disposal			
Dumpsite	413 (98.6)	2 (12.5)	415 (95.4)
Private burning pit	6 (1.4)	14 (87.50)	20 (4.6)
χ^2 -value ($df=1$)	88.33		
p-value	<0.001		

*MWMA =Municipal Waste Market of Authority

Table III: Types and Quantities of Waste Generated in Oja-Oba and Odopetu Markets, Akure, Akure South Local Government Area (20th of Feb- 6th of May, 2017)

Waste type	Number of Waste		Waste Weight (kg)		Mean number		Mean weight	
	Oja Oba (168)	Odopetu (8)	Oja Oba (168)	Odopetu (8)	Oja Oba (168)	Odopetu (8)	Oja Oba (168)	Odopetu (8)
Putrescible			502.63	101.09			2.99	12.64
Polythene	8774	252	36.82	1.24	52.23	31.5	0.22	0.16
Plastic	377	12	48.07	3.83	2.24	1.5	0.29	0.48
Paper	3035	260	40.70	0.94	18.07	32.5	0.24	0.12
Glass, metal and Electronics	71	0	2768.0	0	0.42	0	16.48	0
Total	12,257	524	3,396.22	107.10	72.96	65.5	20.22	13.39

V. DISCUSSION

This study examined waste generation and management in a big (Oja Oba) market and a small (Odopetu) market in Akure South local government area in Akure, the capital of Ondo State, Nigeria. The aim was to determine the effects of size of markets on waste generation and management in the study area.

Findings from the study revealed that in terms of weight, putrescible and electrical, electronics, metal and can were the most important waste types generated in the markets. Ironically, the latter waste group was the least frequently encountered waste but its enormous weight may be explained by its relatively large size. This trend is in agreement with the findings of Maso *et al.* (2008) which investigated municipal waste characteristics in Nicaragua. It also agreed with the findings of municipal waste appraisal in different parts of Nigeria (Amori *et al.*, 2013; Amalu and Ajake, 2014). The percentage composition of putrescible recorded in this study (40.44%) was however, low compared with the records of Awoniyi (2016) in Alaba market, Lagos State, and Topanou *et al.* (2011) in Benin Republic. Paper waste (29.3%) obtained by this study was more than four times (6.6%) higher than those obtained by Aye *et al.* (2006). There was an increase in the percentage of plastics (nylon and plastic) (11.32%) compared with a previous record of 7% by Oyawale *et al.* (2016) in the study area and Tharanathan (2003). The results also revealed that the overall number and weight of all types of wastes were higher in Oja-oba than Odopetu market. Also with the exception of paper waste, the per capita waste generation was also higher in Oja Oba than Odopetu. This could be explained by the apparent population differences between the markets.

Although open burning was a primary treatment option in Odopetu market while in Oja Oba where waste management authorities collect waste from individual generators, the ultimate treatment was still open burning though at the dumpsite while some of the

wastes such as plastic bottle and cartons were been sorted out for sale. According to Ofoezie and Bulu (2015), burning of waste has generally been condemned as the worst method of waste treatment. It is also unethical and environmentally unacceptable. These findings agree with reports from some previous studies including Okojie *et al.* (2000), Awosusi, (2010) and Benedine *et al.* (2011). The finding that there is no formal arrangement for waste evacuation in Odopetu market and that in Oja Oba where a management authority exists, it took over a week to evacuate waste generated and stored in more than half of the stalls is a clear sign of poor waste management. The implication of this untimely evacuation of waste in the markets could be serious to the traders' health and to people resident within the market perimeter (Obayelu, 2012). According to Nwankwo (2004), improper disposal of solid waste constitutes a serious threat to human health and to the achievement of sound environmental sanitation.

VI. CONCLUSION

The findings of this study have shown that enormous amount of different types of waste is generated in the markets investigated in Akure, Ondo State, Nigeria. The quantity of waste generated varied significantly depending on the size of the markets, sections of the markets and type of waste involved. Generally, more waste was generated in Oja-oba than in Odopetu. It was also concluded that waste management was very poor in the two markets investigated. Open dumping and burning of waste which are the two worst waste treatment options are adopted with no plan of improvement. It is concluded that unless these methods of waste treatment are updated, waste management in the markets will remain poor and unacceptable.

ACKNOWLEDGMENT

I appreciates the effort of Mr. Adebayo Abdulquddus Adelayo during the process of the publication.

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Why is customer loyalty so important in the banking sector? - An overview !

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DOI: 10.29322/IJSRP.10.09.2020.p10596
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10596>

Abstract- Today, in order for banks to be productive in the labor market and to be competitive in the market, they must identify customer preferences. For this in this research, an overview of the literature on consumer loyalty in the banking sector was made. From the literature review we as researchers have concluded that the consumer in the banking sector will remain loyal if he is satisfied with the banking services. A service with advanced and fast technology in this dynamic period has made the main factor that determines the customer to select his bank to perform banking services. Many authors have been contacted regarding CL and changes have been made, especially in the banking sector. Through this research we have made a general summary for CL in different countries for the banking sector over the years.

Index Terms- Customer loyalty (CL), client, banking services, banking sector.

I. INTRODUCTION

Competition between banks pushes owners to find ways to ensure market stability and gain competitive advantage even between competition. Thus, attention to customer loyalty has increased more than ever before, which has attracted the attention of many researchers. To improve organizational about industry competitiveness also influences level of productivity and profitability, all the service providing satisfaction and loyalty. Continuous benefit packages businesses are focusing now a day on the satisfaction provided by bank enhance customer satisfaction.

However, focus only on business, whether large or small. The rapid development and application of information and communication technologies (ICTs), especially the vast proliferation of Internet and Web 2.0 paradigm in the recent years, have profoundly transformed the traditional ways of doing business in the banking sector. Bank institutions have significantly enriched their offerings with brand new products and services, being highly customized to meet the needs of their customers. In this context, *Hadžić (2015)* shares the findings of other authors, pointing out the fact that banking institutions, which have succeeded in adjusting themselves to the needs of their customers in a prompt and an adequate way, are the most successful ones. They have to focus their attention on the changes that continually occur in the contemporary business surrounding as well as to introduce new and innovative processes, products, and services on a regular basis, in order to manage those changes on time and in an effective manner (*Zagorac, 2014*).

Similarly, *Rončević (2006)*, while making a comparison between the traditional and the contemporary banking, has stated out that the later one is being characterized by dynamic development and application of new strategies, oriented strictly towards the clients. This behaviour is entirely opposite to the philosophy of the traditional banking, where bank institutions have been oriented mainly towards themselves. According to *Alam, Musa and Hasan (2009)*, traditional bank institutions seek to lower their operating costs, improve the delivery of banking services for customers, and retain customers on a long run by offering Internet banking services. By examining the current situation in the country concerning the perceived levels of customer usage and satisfaction with banking services, the paper aims to determine which variables affect the usage of banking services at most as well as whether there is a mutual relationship between the perceived levels of satisfaction vis-à-vis-banking services and customers' loyalty.

The findings of this study will have many important implications for the industry. Banks will help, discover the relationship between customer loyalty. Also, customer loyalty is greatly influenced by customer satisfaction and customer satisfaction identified as an important predictor of customer trust. Since loyal customers are profitable customers, banks are looking for ways to make loyal customers to them. Therefore, customer loyalty to banks can practically be achieved by increasing the satisfaction and trust of bank customers. However, this research for the banking sector will help banks design strategies to satisfy customers through which they build customer trust and make them loyal to the bank.

The rest of the research is structured as follows. The literature review is presented in the second section, which focuses on: the meaning of banking services; as well as the consumer satisfaction and loyalty in developing countries. Last section of the paper presents the conclusion and recommendation of the study.

II. THEORETICAL BACKGROUND

Globalization, deregulation and financial innovations have all a significant impact on increasing the competitive levels in the banking sector. Therefore, banking institutions have to pay a great attention to the improvement of the quality of their services, which is a key premise to their better positioning on the market (*Radojević, Marjanović, 2011*). The quality of banking services along with the clients' satisfaction and loyalty are both significant determinants that underlay the success in modern banking (*Islam, Ali, 2011*). Since the banking sector is a service-oriented business,

the appliance of contemporary technologies is necessary to improve the quality of services (Karim, Chowdhury, 2014). One of the most evident results that arise from the direct appliance of the ICTs in banking sector is the development and proliferation of e-banking. There is a plethora of definitions about what actually means the term 'e-banking'.

To name a few, Srivastava (2007) defines e-banking as a system which allows the customers to access their banking accounts and get information about banking products and services over the Internet. According to Suki (2010), among the most prominent primary factors are the perceived perception, complexity, and hedonic-oriented features of banks' Internet webpages. In addition, the results of a study conducted by Kumbhar (2011) vis-à-vis the most important factors affecting customers' satisfaction in e-banking are as follows: brand perception, perceived value, cost effectiveness, easiness of usage, and convenience. Moreover, Australian banks that provide user-friendly interface, website reliability, transactional capabilities, and activities that foster customers' education about online risks are more successful in the area of e-banking (Poder, 2005). Namely, it is a great opportunity for them to standardize the delivery of their services to customers, as well as to increase their profitability by reducing the services' processing costs. At the same time, it significantly increases the chances of attracting more clients.

A. *Customer Loyalty*

The concept of loyalty first appeared in the 1940s. In its infancy, this concept was introduced as, "brand preference" which was later mentioned as loyalty to stay and "market share", which was later mentioned, as loyalty of conduct. Nearly 30 years after loyalty first appeared in academic literature scholars (Day, 1969) proposed that loyalty could be more complex and that it could involve a loyalty of attitude and behavior.

Customer loyalty is the attitude and behavior of the customer to limit satisfaction with the product or service. Customer loyalty has an official to do it in gaining competitive advantage Among firms for more under a competitive and dynamic opportunity. Customer loyalty is difficult to define. In general, there are three distinctive approaches to measure loyalty:

- ❖ behavioral measurements;
- ❖ attitudinal measurement;
- ❖ and composite measurements.

In coordination with (Peiguss, 2012) it states that: "Customer loyalty is defined as the willingness of any particular customer to purchase the company's goods or services over those competitors available in the market." Whereas according to (Singh, Khan, 2012) it says that: The client gains trust as a result of good experiences from the past and for this the client again comes and performs banking services in the bank that is satisfied. According to the authors Ghavami & Olyaei, (2006) and Zikmund, (2002) the loyalty of the clientele is influenced not only by the price of the service but also by the emotional connection that the client creates and the trust in that bank, etc.

According to (Segoro, 2013), the customer's loyalty is explained in three cases:

- ❖ first, the steadfastness appeared through the client's conduct with repetitive purchasing;
- ❖ second, the loyalty shown through the customer's attitude about the company (this factor includes

preference and commitment to the brand and advising it to the others)

- ❖ and third, a composition of the customer's behavior and his attitude about the company.

In general, customer satisfaction with a company's services is considered the key to a company's long-term success and competitiveness. Customer satisfaction is the determining factor that keeps the company in its clientele.

But on the other hand the author like Peiguss, (2012) emphasized that pleasure is not the determining factor in the attitude of the client in the enterprise. He says in his research that if a customer leaves satisfied with the banking service it does not mean that 100% safe will come back to your bank. According to the author, customer satisfaction is short-term. Singh & Khan (2012) conclude that fast service, reasonable prices affect long-term customer loyalty and thus long-term profitability. With the understanding of the behavior of the customers and satisfying them provides the benefit to the business in the long term. It is thought that establishing good relationships with customers by providing better services will build customer loyalty. This will affect the long-term profit of the business and will be more competitive in the market. According to Agchi & Xingbo (2011) the loyalty of the clientele is also influenced by the location of the bank or the different distance of banking services. Omar et al. (2009), emphasized that marketing utilization affects customer loyalty. According to the author in question, marketing tools do not allow to forget in the customer's memory the good service for a certain period of time.

Also East et al. (2005), the authors argue from the findings of the study that in three areas should contribute to increase client reliability such as: Good behavior, continuous communication by keeping the clientele informed of the latest changes, and prompt service. Also, according to the author Kumar & Medha (2013) in CL many influential factors among them are:

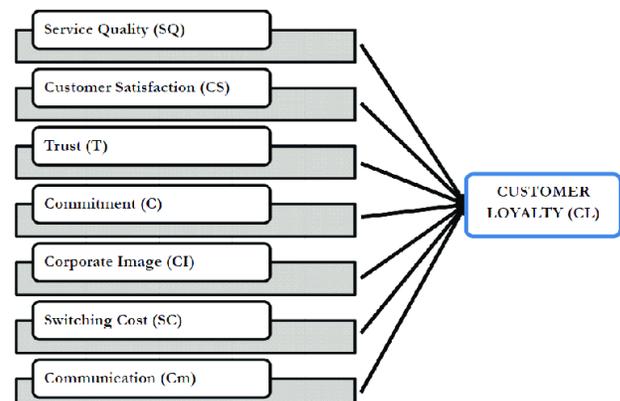


Figure 1 Customer Loyalty Formation.

Source: https://www.researchgate.net/publication/269829674_The_Antecedents_of_Customer_Loyalty_An_Empirical_Investigation_in_Life_Insurance_Context/figures?lo=1

Deighton (2000) tended to that data innovation empowers firms to rehearse singular level promoting which help the wide spread of faithfulness programs into a few businesses, for example, gaming, budgetary administrations, and retailing. So as

to research the conditions under which a reliability rewards program will positively affect client assessments, conduct, and rehash buy expectations.

Henning & Klee, (1997), focused at the customer satisfaction with a company's product or services as it is the key to company's success and long-term competitiveness. The author considered customer satisfaction a central determinant of customer retention. The overall purpose of this study is to develop a conceptual foundation for investigating the customer retention process, with the use of the concepts of customer satisfaction and relationship quality. The study has a critical examination of the satisfaction-retention relationship, and the development of a comprehensive view of the customer's quality perception. **Dowling and Uncles (1997)**, explained that there are three primary lessons from the research they did." First, a major reason for launching of many customer loyalty programs is competition. Second, if a loyalty program does not support the product or service value proposition, it might be justified in attracting more distributors to deal with the product. Third, brand loyalty is more likely to come from the market". On the other hand, we have **Singh & Imran (2012)** estimate that on average online retailers lose 25% of their clientele. The authors also point out that if different policies are followed to retain the clientele, it would increase the firm's profit by 25%.

Today, various techniques are used to measure customer satisfaction in banking services. Moreover, recommendations or oral communication are also important tools to determine customer satisfaction. Good experience with banking services makes the client evaluate the bank. Basically, customers who have good experience will encourage others to perform banking services in that bank. Customer loyalty is also sometimes described as repeated purchases by the same trader over a period of time. And in conclusion customer loyalty is the main objective of measuring customer satisfaction.

III. CONCLUSIONS AND RECOMMENDATIONS

In addition to the high level of competition in the banking sector, banks decide to increase and further offer its portfolio with new products and services, to advance them existing so that you have the opportunity to use and currently use. Moreover, to this day, it is essential for banks to use marketing segment strategies through direct communication with current and potential customers. For more services and its advantage over the competition in the best business case, it is possible for banks to become innovative, creative and identify more with other tire customers. Taking care of this, only they can want to earn more compared to the tire competition and offer a higher quality product and service that you will be more likely to want and want to change from customers. This study was created to look at the findings of different authors and at different times and regions what affects customer loyalty. From various researches we have come to the conclusion that many factors affect the loyalty of the clientele.

It is important to note that for any service industry, customer satisfaction is very important to the success of the business entity because it influences the choice and the decision of the customers to return to the same services. Companies need to retain existing customers by effectively meeting their needs in order for existing customers to become loyal. Hence, through providing good

services, the perception of customer can be changed positively towards revisit intention and once the positive perception has been developed, the loyalty can be seen more effective and definitely it would effect on customer return intention. When the client shares a positive experience is the key to success for their loyalty. Some of these general recommendations are:

1. Management policies should focus on continuously improving their services in line with clientele preferences.
2. The services provided should be divided according to age, educational level, cultural level and if necessary the staff should hold additional training.
3. The employees of the bank should support the working staff, give the right support because in this way the needs and desires of the clients are understood.
4. In order to attract new clients, the bank must sometimes provide free services as part of its policy.

Since this research has some limitations, it is useful to conduct future studies that deal with the impact of certain factors that affect client loyalty. Banks should provide and continuously improve their quality of services to suitably meet the need of customers for satisfaction that could result in loyalty.

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The impact of service quality and customer satisfaction on banking services - an overview!

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DOI: 10.29322/IJSRP.10.09.2020.p10597
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10597>

Abstract- Financial transactions are a part of daily life - regardless of whether done through a bank office or by method of other online channels. Banks perform services such as: including fund transfers between accounts both within the bank and different banks, bill payment, credit card payment, utilities payment and also configuring the initial set up for access to such services. So, the study focuses on the commercial banking sector.

This study is an attempt to explore the interrelationship between service quality and customer satisfaction. As and evaluation the importance of customer satisfaction in receiving banking services. Quality customer service and satisfaction are recognized as the most important factors for bank customer acquisition and retention (Jamal, 2004; Armstrong and Seng, 2000; Lassar et al., 2000). Satisfied customers rarely file complaints and are overall more loyal to the bank.

This will be a real contribution for the banks because in this way, banks can seek guidance to improve their service quality in order to retain their customers. Previous results show that service quality has a positive and significant effect on banking services and shows that customer satisfaction has a positive and significant effect on financial performance.

Index Terms- Service Quality, Customer Satisfaction, Banking Services, Banking Sector.

I. INTRODUCTION

Why is customer satisfaction research so important? Satisfied customers spend more money, refer more customers and patronize businesses longer than unsatisfied customers. This all prompts more income for organizations that can keep their clients fulfilled. Subsequently, organizations endeavoring to boost income should truly think about putting resources into a consumer loyalty and dedication research program. (Pokalsky)

Numerous nations around the globe have begun giving more consideration to estimating client or buyer fulfillment at the national level, including Africa, America, Asia and Europe. To explore the satisfaction level and the factors that affect the consumer attitude many researchers have conducted studies. Research suggests that customer dissatisfaction is still the major reason of bank customers' switch to other banks (Manrai and Manrai, 2007). This dissatisfaction could be because of a variety of reasons.

This study gives a greater understanding of the factors that are important to development of an effective banking system and meets customer needs and expectations.

The study aims to investigate the effects of service quality and customer satisfaction on banking services with customer satisfaction. New advances are being presented and there is consistently a dread of financial vulnerabilities. Furious rivalry, all the more requesting clients and the changing atmosphere have introduced an unmatched arrangement of difficulties (Lovelock, 2001) for banks in the nation. Therefore, customer satisfaction is the key for many banks to survive in competition.

In other words customer satisfaction revolves around the state of mind that the customer has about a particular product. Therefore, customer satisfaction plays an important role in consumer buying behavior because a satisfied customer may repeat purchase which may eventually lead to customer retention or loyalty. It is as a result of this that service providers or marketers in general often handle customers in such a way that they can be satisfied with their services or product. (Biradawa, 2019)

Completely comprehension of the client, thinking about him/her as the need and offering quality types of assistance are as the assuring factors of success in the today's business market. Today's interpretation made of a customer is quite different to what has prevailed in the past. This implies a client is certainly not a negligible buyer of merchandise or services any more, yet he is somewhat considered as a functioning and powerful part in all business exercises. what's more, growing associations with client and attempting to fulfill him in all stages will build the proficiency and adequacy of an association in accomplishing the client.

II. LITERATURE REVIEWS

a. CUSTOMER SATISFACTION

The word satisfaction derives from that latin "satis" (meaning good enough, adequate) and "facio" (do or make). Decisions can be interpreted as "an attempt to accomplish something" or "make an adequate". Oxford Advanced Learner's dictionary (2000) describes satisfaction as "the good feeling that you have when you reach something or when something that you want to happen does happen"; "the act of fulfilling a need or desire"; and "an acceptable way of dealing with a complaint, a debt, an injury, etcCustomer satisfaction is a state of mind that customers have about a product or services after using that product and service offered by a company in return of customer expectations about the products. (SABIR, ET AL, 2014, 3)

Fundamentally, satisfaction is something individual. An important role has An individual's satisfaction to achieve a bank's goal. Customer satisfaction according to Oliver (1997) is the meeting between the expectations and reality of a selected product

and service. Customer satisfaction has been considered the essence of success in today's highly competitive banking industry. Prabhakaran and Satya (2003) stressed that the client is the king. Even Richard L. Oliver (1997) in his book "Satisfaction: A Behavioral Perspective on the Consumer" states that everyone understands what satisfaction is, but once asked to define it, nobody seems to know. Customer satisfaction is one of banks' goals today.

To foresee furious rivalry in service industry, Banks must offer types of assistance which meet clients' prerequisites and fulfillment. Therefore, a processing of quality of service offered to meet customer satisfaction is required. Clients' have the opportunity to survey whether the services offered by banks give them the normal fulfillment or not.

Various organizations in order to assess customer satisfaction with their products and services have applied the ACSI model in their marketing. A key point of the model to measure customer satisfaction with a variety of products and services, as well as the ability to compare results is the ability to use similar types of questions. Which means that the results can be applied in order to ascertain customer satisfaction and as a resource to create the ability to compete at the micro level as well as at the macro level - by industry sectors to include the country as a whole. The model can also be used to analyse factors affecting consumer behaviours, which can be applied to develop and improve the effectiveness of an organisation. (Unyathanakorn & Rompho, 2014, 51)

Source of the idea is identified with the advertising idea that benefit is created through fulfillment of client needs and needs. (SABIR, ET AL, 2014, 3) We have a number of studies supporting the fact that we have a link between customer satisfaction and bank performance (Jham and Khan, 2008). Customer satisfaction has been studied by a number of researchers in the retail banking industry. The vast majority of the scientists found that service quality is the predecessor of consumer satisfaction (Bedi, 2010; Kassim and Abdullah, 2010; Kumar et al., 2010; Yee et al., 2010; Kumar et al., 2009; Naeem and Saif, 2009; Balaji, 2009; Parasuraman et al., 1988).

Organizations at that point need to adjust their activities and endeavors to fulfill and hold clients, conceding to the significance of clients in driving execution (Johnson et al., 2000). As markets shrink, organizations are scrambling to support consumers satisfaction and keep their present clients as opposed to dedicating extra assets to pursue likely new clients. This is on the grounds that it costs five to eight fold the amount of to get new clients than to clutch old ones is vital to understanding the drive toward benchmarking and following consumer satisfaction (Cacippo, 2000).

Customer satisfaction can be corresponded with a number of factors. In a study conducted by Colgate (1997), he has found out that customer service is the most important factor that influences satisfaction rates or levels. Also of significance are tuning in to the necessities of clients and worth.

In addition to service quality, also one of the factors that affect satisfaction, and customer loyalty is institution image (Beneke et al. 2011). Client input or estimations of consumer satisfaction can help recognize atrisk clients, representatives and accomplices before they are lost. Consumer satisfaction estimations can likewise give important bits of knowledge into

new items or services your clients need, putting one's organization ahead of the competition (David, 2006).

Customer satisfaction leads to product repurchase that ultimately leads to brand loyalty. In mid 1970's consumer satisfaction developed as an authentic field of study. The first study of agriculture's Index of Consumer satisfaction to report direct information on consumer satisfaction was U.S department. (Pfaff 1972). As a rule, if the clients are happy with the given products or services, the likelihood that they utilize the services s again increases (East, 1997). Additionally, fulfilled clients will most likely speak excitedly about their purchasing or the use of a particular service; this will prompt positive publicizing (File and Prince, 1992; Richens, 1983) Then again, disappointed clients will most presumably switch to an alternate brand; this will prompt negative publicizing (Nasserzadeh et al. 2008).

b. SERVICE QUALITY

Since the day that the job of the service in regular day to day existence got clear, the services quality issue was considered as the principle highlight of rivalry among organizations with the goal that given the quality of services, the organization can become different from its competitors and this results in achieving competitive advantage. Gronroos (2000) defined service as, "A service is a process consisting of a series of more or less intangible activities that normally take place in interactions between the customer and service employees or physical resources or goods and/ or systems of service provider, which are provided as solutions to customer problems".

Parasuraman, Berry and Zeithaml (1988) who emphasize that service quality is the customer's perception of the service expected with the service received. A few authors have connected the quality of service with customer satisfaction (Dauda and Lee 2016; Ali and Filieri 2015; Jun, Yang, and Kim 2004). Lovelock and Wright (2005: 96) further state that customers assess their level of satisfaction or dissatisfaction after using services.

Cronin and Steven (1992) stated that service quality is the actual performance of services provided to customers. Like any other industries, the banking industry focuses on earning profit through ensuring expected level of customer satisfaction and retention. In order to do so, proper attention must be given to the service quality.

Fogli (2006) defined term service quality as "a global judgment or attitude relating to particular service; the customer's overall impression of the relative inferiority or superiority of the organization and its services". The connection between services quality and consumer satisfaction has been submitted to exceptional investigation by leading service quality specialists (Bitner and Hubbert, 1994; Bolton and Drew, 1994), just as the connections between quality, consumer satisfaction, client maintenance and gainfulness (Storbacka et al., 1994).

Thus, as a core competitive strategy banks need to concentrate on service quality (Chaoprasert and Elsey, 2004). One of the ways to improve quality of service is by fulfilling customers' expectations.

Kotler and Keller (2009: 143) characterize client focused quality and state quality is the entirety of highlights and attributes of an item or service that relies upon their capacity to satisfy expressed or inferred needs. We can say that the seller has conveyed quality when the item or service has met or surpassed client desires.

Quality of Service is “Quality customer service is the assessment of the merits or feature of a product or service”. Characterized as clients' appraisal on advantages or uniqueness of an item (Zeithaml, 2008:89).

The service quality factors recognized by Parasuraman et al., (1994) are reliability, responsiveness, competence, accessibility, courtesy, communication, credibility, security, understanding and tangibility. Alfred and Addam (2001) investigated attitudes with fifteen service quality variables. In the current examination, the service quality in retail banking is studied using factors drawn from the reviews (Cronin and Taylor 1992; Zillur Rahman, 2005; Verma and Vohna 2000; Mushtag A Bhat, 2005)

While, according Zeithaml and Bitner (2008:112), service consists of five dimensions: Reliability, Assurance, tangibility, Responsiveness and Empathy.

1. Reliability is the ability to perform the services certainly and correctly. While responsive is the capacity to support clients and give quick services.
2. Assurance serves to increase customer confidence from service providers, who meet customer requirements.
3. While tangible dimension is physical appearance of service providers such as buildings, equipment layout, interior and exterior, and physical appearance of service providers' personnel.
4. Empathy, is specialist co-ops' capacity to focus on clients.

Service quality has several indicators:

- a) Ability to perform the promised services
- b) Knowledge and politeness
- c) Care for customers
- d) Willingness to help customers
- e) Appearance of physical facilities

One of the reasons of the switching of clients starting with one bank then onto the next bank is on the grounds that clients aren't happy with the manner in which the bank takes care of issues or handles issues. For researchers, Service quality is one of the most attractive areas over the last decade in the retail banking sector (Avkiran, 1994; Stafford, 1996; Johnston and Jeffrey, 1996; Angur et al., 1999; Lassar et al., 2000; Bahia and Nantel, 2000; Sureshchandar et al., 2002; Gounaris et al., 2003; Choudhury, 2008).

Service quality is considered as one of the critical success factors that influence the competitiveness of an organization. A bank by providing high quality service, can make a difference from competitors. (MISTRY, 2013, 133).

III. DISCUSSIONS AND CONCLUSIONS

Providing different products by different banks so as to hold existing clients and pulling in new clients and at last increasing a more prominent portion of the banking market is considered as the key priorities of banks. Therefore, is considered as the key priorities to identify the strengths and weaknesses in the customers.

The overall findings on the factors affecting customer satisfaction with banking services show that customer expectations towards the quality and value of the service have an effect on their satisfaction and loyalty. the services quality in the

banks and respect to its appraisal isn't just a strategy, yet in addition the nature of prevalent assistance is actually the qualification perspective among effective and inefficient banks (Khorshidi et al, 2014).

Today the consideration regarding consumer satisfaction and disappointment is getting greater. The parties most directly related to customer satisfaction or dissatisfaction are consumer marketers, consumers, and consumer behavior researchers. More tight rivalry, where an ever increasing number of makers are occupied with satisfying the requirements and needs of shoppers, makes each organization place a direction on consumer satisfaction as the essential objective.

The concept of service quality and customer satisfaction is related to one another. Service quality is related to customer perceptions of quality based on long-term cognitive evaluation of corporate service delivery, while customer satisfaction is the customer's short-term emotional reaction to a particular service experience.

As indicated by Olsen and Dover (cited in Zeithaml, et al., 1993), client desires or desires are the convictions of clients before trying or buying a product or service. In any case, the conceptualization and operationalization of client desires stays a controversial issue, particularly with respect to the qualities of explicit desires guidelines, the quantity of norms utilized, and the source of expectations. Each consumer may have a few diverse pre-utilization desires. Moreover, various shoppers may likewise apply various sorts of expectations for various circumstances.

Quality of service has a huge impact to consumer satisfaction (Ratanavara et al. 2015; Ali and Raza, 2015), In this manner, considering the services quality is vital so as to diminish the costs, proper profitability and customers' satisfaction (Hosseini et al, 2010). The effect that occurs is mediated by partial customer satisfaction either by simple or multiple mediation. Thus, in this case the quality of service is one key determinant of success in creating customer satisfaction which then affects customer loyalty (Kuo et al. 2011).

It should be noted that customer satisfaction is affected by a few factors that one of the most significant of these elements incorporates the quality of product or service in reality, the customer satisfaction has a close relationship with providing quality or service.

At present in a competitive market, institutions endeavor to hold clients by relying on their satisfaction and loyalty, so a definitive objective of the institutions is to prevail with regards to acquiring and keeping up client repurchase expectations and eventually money related execution (Egblopleali and Aimin; 2011).

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The Effect of Project Implementation on Poverty Reduction in Rwanda: A Case Study of Project in Vision 2020 Umurenge Programme in Bugesera District- Rwanda

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DOI: 10.29322/IJSRP.10.09.2020.p10598

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10598>

Abstract: The main objective of the study was to investigate the effect of project implementation on poverty reduction especially those projects in VUP. The researcher adopted the descriptive survey design because the study sought to gain insight or perception into a phenomenon as a way of providing basic information in the area of study. The study population comprised 1481 in total including 1361 VUP Beneficiaries, 15 Executive Secretaries of sector and 105 Executive Secretaries of cells in Bugesera District. The researcher used simple randomly sampling to select the sectors and used also purposive sampling to select the cells. The researcher used Morgan and Robert formula to determine the sample size. Primary data was collected using the questionnaire and interview. The interview was used for executive secretaries of cells and sectors and questionnaires for VUP beneficiaries. Data was analysed into tables and graphs applying descriptive statistics (frequency, percentages and mean) by statistical tools such STATA 13.1. The research revealed that VUP project are interested according to objective one the majority (96.07%) of respondent agreed to the statement saying that public work on poverty reduction is highly appreciated. Due to the objective two also, the respondent highly appreciated at 89.27% of the respondents and they confirm that direct support on income generation for beneficiaries toward poverty reduction is needed for different beneficiaries. The findings have key policy implications calling upon the government and policy makers to focus not only on the development of social services but also on the development of agriculture and other small business enterprise.

Key Words: VUP Programme, Poverty reduction, Direct support, Credit package, Rwanda

1.0. Introduction

There has been much efforts world over to reduce extreme poverty levels in most counties. These efforts have not only

been carried out by international organizations, but also by different governments across the globe. However, poverty still remains a great challenge especially for developing nations and more a challenge for Least Developed Countries (LDCs). In these countries more than 75% of the population are still in extreme poverty (United Nations Conference on Trade and Development UNCTAD, 2019). According to a report jointly prepared by United Nations Department of Economic and Social Affairs (UN DESA) and other United Nations bodies, many countries still drag in the fight to reduce poverty levels. The report highlights challenges that are faced by these nations in regard to poverty and the related problems. The report further mentions that one of the key efforts for poverty eradication is for countries to achieve Sustainable Development Goals (SDGs) which should be a collaborated effort of the national governments, international bodies and the private sector (DESA UN, 2020). Therefore, poverty and hunger reduction in both rural and urban areas, will depend on the sustainability of community development.

Nowadays many people are worried about the growth concept for many reasons a realization which is not better, and/or devising strategies to reduce outside dependencies and minimizing the level of poverty. The development of the community takes into account the conditions and the contribution of the community. With the development of the community, the intention is to improve the quality of life. This development of community is not achieved by an individual alone but it is achieved through mutual responsibilities. The development should recognize social, cultural, economic and environmental conditions.

Rwanda started applying the new strategy to eradicate poverty in 2008. That development is called Economic Development and Poverty Reduction Strategy (EDPRS). Since 2008-2012, EDPRS sets the objectives of priorities to be achieve in next five years in three programs such as: increase of jobs, governance and vision 2020. The country level stakeholders support the program of EDPRS. As the government of Rwanda created

different programs to fight against poverty vision 2020 is the first, EDPRS is the second. All these programs facilitate the achievement of MDGs which lead to the sustainable development (Economic Development and Poverty Reduction Strategy, 2007).

The research in Rwanda shows that the poverty of citizens has root from the destruction of properties as the consequences of 1994 genocide against Tutsi, shortage of land, environmental degradation, etc. Poverty is the problem that goes beyond lack of food, clothes, shelter and social welfare (Bugingo, 2001). In general, development in Rwanda for eradicating poverty is guided under 2020 vision for the development of Rwanda, it presents the key priorities and provides development of Rwanda with the guidance to the future's economic development and poverty reduction strategy to eradicate the barriers for millennium development goals and the country's vision 2020. In fact, "the Vision 2020 Umurenge Program (VUP) has been implemented in Bugesera district to improve living conditions of the population. The researcher investigated the impact of VUP project implementation on poverty reduction to improve the living conditions of the beneficiaries.

Reducing poverty has been a great matter of concern to Rwanda due to the fact of what happened in 1994 of the Genocide against Tutsi. Many infrastructures were destroyed which left the people in rural areas with scarce resources and insecure with housing, food and shelter problems. However, to build successful local rural areas through VUP contribution for accelerated poverty reduction and development in economic growth, agricultural inputs resources on making agricultural growth performance must be available to policy makers (PRSP, 2011).

The people of the Bugesera District still practice poor and/or traditional ways of doing agriculture in their livelihood, where the majority of Bugesera District specifically those of Ngeruka Sector, Rweru Sector, Mwogo Sector, Nyarugenge Sector and Shyara Sector live under poverty line within limited plots. Their capacity was very limited to boost their agricultural practice and production, they depend mainly on agriculture for surviving and remain as the most vulnerable and marginalized people in Rwanda. Progress in poverty reduction and speed economic development, Rwanda is still facing many developmental challenges. The most recent household living conditions survey (the EICV 4) also found that poverty rates vary enormously between provinces and from district to district (Bugingo, 2001).

Poverty is still a big problem in rural compared to the urban area whereby 48.7 % in rural area fall under the line of poverty while only 22.1% in urban area fall under the line of poverty. There is also a big challenge in accessing social amenities and social facilities. EICV 4 shows that Bugesera district ranks 9th among the districts whose population fall in the category of poor population. This category represents 47.7% of the population in Bugesera, making up about 173,313 persons. Just over half (52.3%) of the population in Bugesera district is identified as non-poor, 34.3% as poor (excluding extreme-poor) and 13.4% as extreme-poor. While compared with other seven districts of Eastern Province, Bugesera District is

ranked third by levels of non-poor after Rwamagana and Kayonza districts (National Institute of Statistics, 2013). The general objective of the study was to establish Impact of project implementation on poverty reduction to promote the living condition of people in Bugesera District, Rwanda. The specific objectives that guided this research were

- i. To identify the roles of public work on poverty reduction in Bugesera District, Rwanda.
- ii. To assess a direct support on income generation for beneficiaries toward poverty reduction in Bugesera District, Rwanda.
- iii. To examine the potential capacity of financial services to eradicate the poverty in Bugesera District, Rwanda.

2. LITERATURE REVIEW

2.1 Theoretical Literature

Poverty is the state in which individuals lack what they need for surviving for example, food, house, clothes, poor water and other facilities (Sen, 1999). If poverty undermines the welfare of people, it should not be seen and keep quiet instead everyone should work hard and be innovative as well as creative to initiate the income generating activities and be responsible for their lives (Goetz, 2003; Goering, Feins, and Richardson, 2003).

On the other hand, if traditionally, some people believe that poverty is hereditary, the government should not keep quiet instead should educate them about the cause of poverty and how to fight against it. Another problem is trying to work traditionally based on the culture for example sticking on agriculture for only consumption, and not participating in international trade therefore the government should sensitize people about the strategies of raising family economy that goes beyond family consumption and think about money provision. Many literatures show that many people fall under the line of poverty without considering how much competent they may be. The problem of poverty is that the families are not satisfied in their needs (Jencks, 2011). Poverty is seen as the results of unemployment or nonproductive jobs.

Rwandan government knows that its institutions apply primordial inspiration on the stability of the society, wealth and the welfare of its populations. The stability of economy of the government depends upon the well-functioning of government entities, civil societies and non-governmental organizations. This way the government of Rwanda tries to enhance the good governance first for sustainable development because without good governance nothing can go smoothly in the country. Today's hindrances of social and economic development in Rwanda are in these categories. The rampage problem of poverty from generations to others. The problems caused by the genocide of 1994 against Tutsi as its consequences such as destruction of infrastructure and loss of properties. Nowadays the government of Rwanda is dealing with the issue of strengthening the power of populations so as to help them come from the line of poverty and achieve the line of wealth these are being done through different programs like EDPRS and VUP (Bugingo, 2001).

2.2 Empirical Review

This is our aspiration as Rwandans to build the government of national unity which is democratic and which ensures the sustainable development of the country. The Rwandan government strives to be successful at both regionally and internationally (Vision 2020, 2000). For attaining this, 2020 vision outlines six intermingling pillars, comprising governance and well-organized State, expert and capable human capital, private sector which are vibrant, in addition to sophisticated agriculture and modern livestock 2020 vision is the results of the national consultative held from 1997-2000.

This negotiation included different citizens of Rwanda from different domains, such as civil society, political leaders, members of different political leaders and other consultative (vision 2020, 2000). Community works are used as the strategies to enhance community assets without spending a lot of money. As we have private land ownership is in Rwanda, the public works are mostly done on the land belongs to the government. The community work should benefit the whole society without discrimination.

The government should set the strategies to eradicate poverty. These strategies include the well use of scarce resources and work hard to increase the available resources. Therefore, the government should high the manpower who are able to use and train others to use resources well, and who can encourage creativity among people.

EDPRS is considered as a process and as well as document. First of all EDPRS outlines, the objectives and the policies for the country development (2008-2012). It provides a map of government, the partners and the private sectors. It shows where the government of Rwanda wants to achieve and the needs for achieving there.

The EDPRS is broken into 2 (two) ways. At the first the strategies redefine the country's economy. At second, the strategies explain the ways in which we can do things in Rwanda. Particularly the case for consolidating and extending of decentralization of public. The also considered the role of private sector in growth acceleration in order to reduce poverty (EDPRS, 2007).

The EDPRS allocates the necessity for accelerating the growth to make employment and increase exports. This will be achieved through ambitions, the quality of the public investment program and this aimed to reduce the price of business. This will create the strong incentives for private sectors so as to improve its investment in the coming years. With 2/3 of the population aged below 25 (twenty-five) years. Mainly the emphasis was on creating opportunities for young population.

2020 vision Umurenge is a decentralized and integrated rural development program intended to make poverty reduction acceleration in Rwanda. This was recently tried in the thirty sectors of the country. The 2020 vision Umurenge program (VUP) utilizes present system of decentralization and influences monetary and technical assistance to accelerate the level of reduction of poverty. The target is to eradicate the dangerous poverty.

2.3 Theoretical Framework

VUP's theories presents the overall goal of the programme, that is, to contribute to reduced income poverty and inequality levels in Rwanda. It also presents the programmer's purpose which is to quicken the poverty reduction levels in targeted VUP sectors. As previously noted, the framework is based on the theory of change of VUP that uses programme components to support people living in extreme poverty in order for them to eventually graduate out of poverty, thus reducing the overall extreme poverty level in the country.

However, specific outcomes, or results for each programme and operational component could be elaborated to allow for evaluation at a level higher than outputs and to better consider the overall desired impact of each component and area of VUP. Further, the framework with 2009/2010 progress does not include performance data for some of the key outputs, in particular due to an unavailability of information not only at National level, even for the region level.

The output level of the VUP's theories framework is well formulated and the indicators developed provide adequate measurement for quantitative information. More qualitative information about programme delivery and effectiveness is needed and indicators should be reflecting both annual and end-line targets. Further, a risk analysis and inclusion of key assumptions should be conducted in order to mitigate potential risks (World Bank, 2003).

Although some of the outputs can be achieved, the VUP framework does not clearly link this with addressing the causes of poverty. In particular, problems such as mindset, capacity building and training, sensitization, participation and ownership, collaboration between actors and interface management are not explicitly expressed in the VUP framework. This can hamper sustainability of VUP's achievements. There should be a consideration of the causes of poverty within VUP communities such as low capacity of beneficiaries, financial illiteracy and cultural hindrances (such as the perception that taking credit is a sign of economic weakness, or the economic exclusion of women, etc). Although this has been discussed elsewhere, some of these causes and challenges was more explicitly elaborated in the logical framework.

The framework was also need to consider the sustainability of outcomes. In particular, how to make sure that the achievements will continue to manifest themselves over a long period of time without VUP. This was considered VUP's exit strategy, which is lacking from the program altogether. Without a sustainable exit strategy, VUP achievements could be severely threatened.

2.5. Conceptual framework

This links the variables in the study at abstract level. The "conceptual framework" is a graphic presentation of the interrelationships of the variables at play Newton (2001). The following conceptual framework illustrates different variables involved in this study.

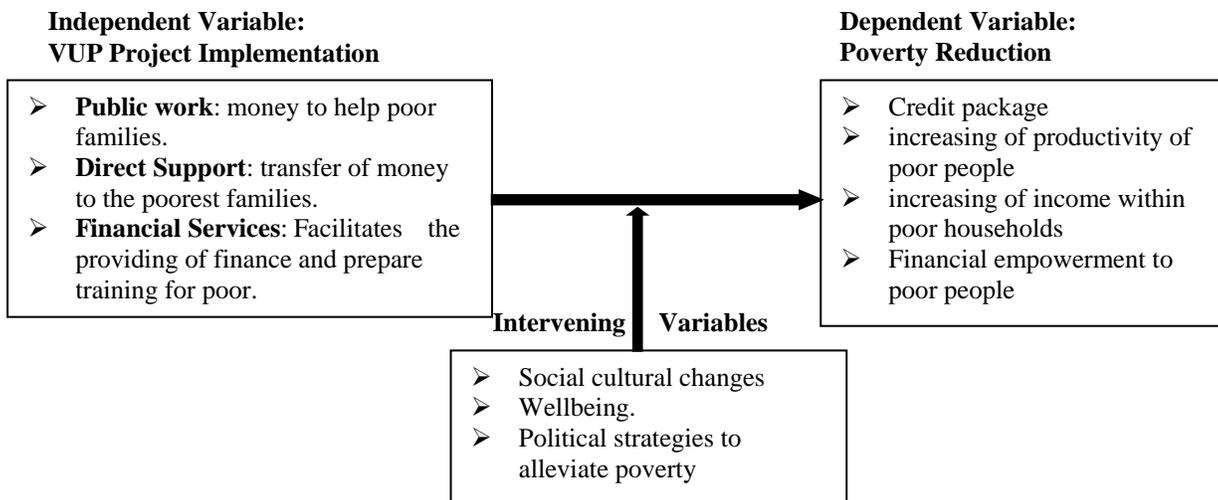


Figure 1: Conceptual Framework

Source: Researcher, 2020

The figure shows the three main components of the project where VUP aims to see beneficiaries move from category 1 and 2 of ubudehe to higher categories, demonstrating a decrease in poverty levels. The three components' programme are not automatically reciprocally exclusive. For example public works can be complemented with credit packages through financial services (FS). One of the purposes of FS is to allow participants to develop their own projects that will eventually be self-sustainable and enable them to graduate out of extreme poverty. Although participants could be engaged in FS and PW or DS, they are only able to be engaged in PW or DS, not both at the same time.

Each component is analyzed separately to allow for an understanding of the most effective programme component to the graduation of beneficiaries. In addition, VUP makes a distinction among household and household members. Eligibility depends on household membership, rather than being the head of household. This is important in order to fit in the females and young who present the main productive capacities but may not be the head of families. The components of the programme should be implemented in the project, which are intended and coordinated at Umurenge level and put into practice at village level. All components and program of the project linked to specialists at the level of the sector who gives the strategic orientations, in addition to basic technical standards and policies.

3. RESEARCH METHODOLOGY

3.1. Research design and Population

Mitchell and Jolley (2012) recommended the descriptive survey design for the study whereby behaviors, thoughts, opinions and comments on the issues under investigation. In this present study the descriptive survey was chosen due to the objectives of the study. The study population comprised 1481 in total including 105 Executive Secretaries (E.S) Cell, 15 E.S Sector and 1361 VUP beneficiaries means each sector provided about 90 VUP beneficiaries.

3.2. Sample design

The researcher chose the zone purposively and used simple randomly sampling to select the sectors in Bugesera District; the technique that was used to select the cell implementing the VUP program is called simple stratified. Stratified sampling gave all cells equal chance to participate in the study.

According to Mugenda (2008), at least 11 percent the population is enough for descriptive survey study. Representatives of E.S cells of selected cells was purposively selected to yield 105 E.S cells. This technique of sampling was used by the researcher based on the experience, qualities, knowledge of the all executive secretary to provide virtue information. The purposive sampling or judgment sampling technique is the deliberate choices of researcher due to the qualities the respondents possess (Bernard, 2002). Executive secretaries' representatives regularly participate in the VUP planning and management and that issue of poverty reduction. They will be often used by the researcher to deal with and handle different issues of poverty reduction through VUP components raised in the district.

Purposive sampling technique was used to select sector where the VUP is implemented such Ngeruka Sector, Kamabuye Sector and Rweru Sector from all sectors in Bugesera District. The number respondents were sampled using the Robert and Morgan (1970) technique which employs the Robert and Morgan's table that is generated from the sampling formula:

$$n = \frac{\chi^2 NP(1-P)}{d^2(N-1) + \chi^2 P(1-P)} = \frac{3.841 * 1481 * 0.5 * 0.5}{0.05^2 * 1480 + 3.841 * 0.5 * 0.5} \approx 305$$

n = sample size that is necessary

χ^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841).

N = the population size.

P = the population proportion (assumed to be 0.50 since this would provide the maximum Sample size).

d = the degree of accuracy expressed as a proportion (0.05).

Table 1: Targeted population and sample size

Group of Respondents	Targeted Population	Sample Size
E.S Sectors	15	3
E.S Cells	105	21
VUP Beneficiaries	1361	281
TOTAL	1481	305

Source: Researcher, 2019

3.3. Data Collection and Analysis

Data collection method is the systematic and exact method of collecting the relevant information comparing to the purpose of the study, to address the objectives of the study, and research questions or hypotheses (Burns & Grove, 1993). The researcher used the combined method that consisted of structured questionnaire and interview. Majority were not able to read and interpret items on questionnaire which were set in English. The researcher therefore translated English into Kinyarwanda to make them understand clearly every item on the questionnaire for VUP beneficiaries. Another way used to get data from the executive secretaries is interview (E.S) because their number is limited.

These structured questionnaires were administered to this category of respondents whose views, opinions and attitudes on how the VUP components affect the poverty reduction to promote the living condition of poorest people in Bugesera district (Kothari, 2004). The questionnaire is also appreciated as

Table 2: Gender of the Respondents

Gender	VUP Beneficiaries	E.S Sector	E.S Cells	Total	Percentage
Male	124	3	14	141	46.22
Female	157	0	7	164	53.78

As shown in Table 2 the respondents to the side of respondents were given equal chance and the male were 141 of 305 equals 46.22% while female respondents were 164 of 305 equals to 53.78%. This means that the gender was ensured by the researcher during the “research.”

VUP Beneficiary Categories

All VUP beneficiaries are involved in the study, the selection was based on the knowledge, their motivation for VUP activities and period working with the Vision 2020 Umurenge Programme. There are 4 categories of VUP Beneficiaries like “Absolutely poorer (Umutindi nyakujya), Very Poor (Umutindi), Poor (Umukene), Resourceful poor (Umukene wifashije)”. The study set to gather information on the categories of VUP Beneficiaries of participants. The outcomes are recorded in Figure 2.

As shown in Figure 2, those who were classified as absolutely poor were 107, those very poor were 103 while 42 were poor and 25 resourceful poor.

it was easily used on a large number of subjects. The questionnaire has composed of closed-ended questions. Likert Scale questions was used to measure extent of agreement or disagreement of respondent according the statement. The questionnaires were individually administered by the researcher and directed to the participants.

The semi-structured interview schedules were considered appropriate to the local authorities. Therefore, it was used to obtain the supplementing information from the local authorities. The purpose of interview was to elicit information that supplemented the data to be gathered through questionnaires.

Quantitative data from the questionnaires was examined by descriptive statistics which include frequencies, percentages by using statistical tools like Stata 13.1

4. RESEARCH FINDINGS AND DISCUSSIONS

The findings from the study established that 100% VUP Beneficiaries of questionnaires were returned. The researcher managed to interview 3 E.S Sector and 21 E.S Cells interviewed in the selected sectors and cells.

4.1. Demographic characteristics of respondents

The section shows the background of the respondents according to their categories such as age, education level, family status, gender. The total number of the respondents was 305 and they were made of 3 E.S Sector, 21 E.S Cells and 281 VUP Beneficiaries.

Table 4.1 represented the spreading of 281 VUP beneficiaries and 3 E.S Sector and 21 E.S Cells provided to them by their sex.

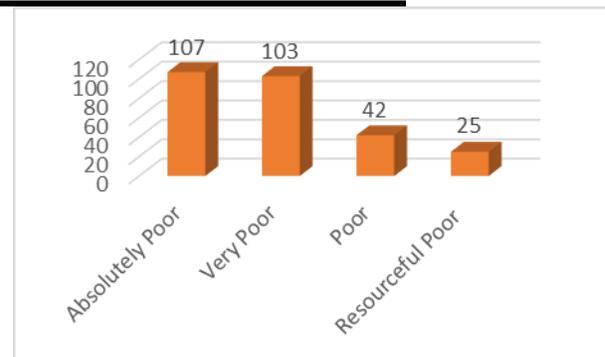


Figure 2: VUP Beneficiaries Categories

Source: field research, 2019

4.2 Presentation of findings

4.2.1 Public works towards poverty reduction

The first objective was stated on the roles of public work on poverty reduction in this study, during the data collection ,the majority (96.07%) of participants was agreed with the statement saying about the how the public work had impacted their life to increase their standards of living, 1.77% of the respondents did not want to provide information to the statement about the roles of public work on their everyday life, 3.1% of respondents was disagree with the statement and due the time, most of sample

population has past more than one year as VUP beneficiaries.

Table 3: The responses from respondent on objective 1

Statement	SD		D		N		A		SA	
	freq	%	freq	%	freq	%	freq	%	freq	%
The public work fit in the economies development for beneficiaries	2	0.71	4	1.42	5	1.77	56	19.92	214	76.15
The public work provide the income generation toward poverty reduction	3	1.06	5	1.77	2	0.77	112	39.85	160	56.93
The public work implementation Participate in poverty reduction	10	3.55	8	2.84	4	1.42	107	38.07	152	54.09

Source: field research, 2019

Due to their time spent in VUP activities the majority (83%) indicated the clear roles of public work for their condition of living and they increased the income individually especially payments of mutual de santé, meals number and components increase, saving on account in Umurenge SACCO, payment of school fees for their children

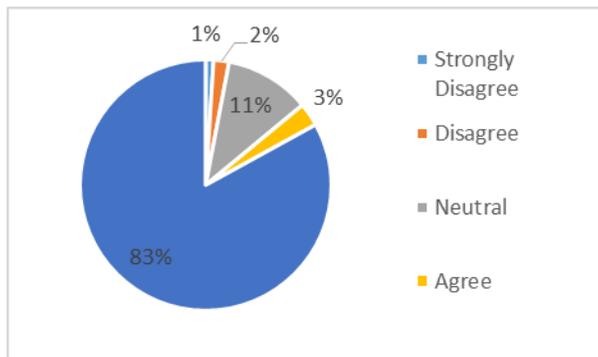


Figure 2: the roles of public work on VUP Beneficiaries

Source: field research, 2019

4.2.2 Impact of Direct support on VUP Beneficiaries for reduction of poverty

The objective two was to determine the outcome of direct support on income generation for beneficiaries toward poverty reduction, the majority (85.57%) respondents strongly agreed with the statement on how the direct support provide the income generation toward poverty reduction to the beneficiaries and the 2.62 % disagreed and 1.64% strongly disagreed with the statement and 1.31% was neutral to the statement but all respondent clearly stating that the direct support from VUP and the result from the participants are shown in Table 4.

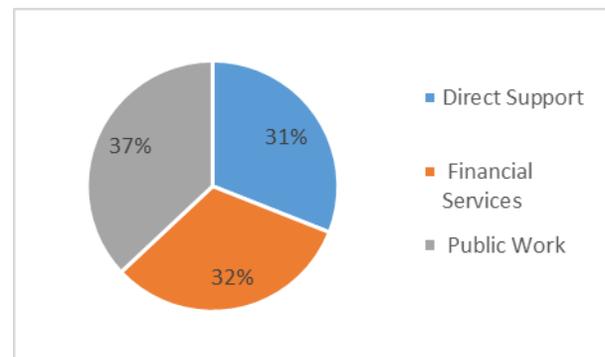
Table 4: Distribution of respondents toward direct support

Statement	SD	%	D	%	N	%	A	%	SA	%
The Direct support fit in the economies development for beneficiaries	5	1.64	8	2.62	4	1.31	27	8.85	261	85.57
The direct support provide the income generation toward poverty reduction	7	2.30	6	1.97	0	0	81	26.56	211	69.18
The direct support implementation Participate in poverty reduction	8	2.62	9	2.95	2	0.66	93	30.49	193	63.28

Source: Researcher, 2019

The sample was distributed among VUP components as follows: 32% in Financial Services, 37% of Public Works and 31% of Direct Support. Figure 3 shows that VUP components were equal distributed from 2015-2017 on averages, which represent long-term cycles of poverty reduction process among them. With the statement mentioned above the direct support provide the changes of income received from VUP activities toward the beneficiaries.

Figure 3: Direct supports as VUP component and their Distribution beneficiaries for poverty reduction



4.2.3 Financial service improves standards of living of Beneficiaries

The objective three was to examine the potential capacity of financial service to eradicate the poverty and the participants indicated that they were aware of the program and stated they were improved the welfare of their families due to financial services from VUP Programme and through this service they shown the asset gained like Payment of mutual de Sante , Saving on account in Umurenge Sacco for their economic

development, School fees payment, Family house renovation, Land purchase, New house building, Meals number and component increase, medical healthcare as it is indicated in Table 5 and indicated that the beneficiaries who were categorized as destitute have graduated to the next level of poorest because they have acquired some assets. Data collected present the situation in Table 5.

Table 5: Table Improvement of assets

No.	Assets gained	Percentage
1	Payment of mutual de Sante	89
2	Meals number and component increase	81
3	Saving on account in Umurenge Sacco	100
4	School fees payment	63
5	Animal husbandry	51
6	Land purchase	19
7	Family house renovation	39
8	New house building	21
9	Others(small business , purchase of bicycle	13

Source: Field research, 2019

Giving fund to the poorer was suggested as the way to eradicate poverty and increase economic development of the country. Researcher suggested the combination of funding and poverty reduction strategies should be most appropriate. Saving is exhilarated and unpaid, so it is regarded as a private matter, but beneficiary testimonies indicated that people are saving on their accounts. Savings included buying assets, make investments in different resources, paying schools fees of children and having different insurances.

4.2.4 Graduation situation of VUP activities within 3 years (2015 – 2017)

When we talk about graduation of beneficiaries, we are talking about the shift of beneficiaries from one category of poverty to another. As we see, in 2015, we had 5.57 % of beneficiaries which were called “Destitute” but in 2016 we have no “Destitute” in our sample. The poorest were 36.39 % in 2015 but in 2016 there are 28.85%, even if there are 7.54% who shifted from Destitute to Poorest, the rate remained low because many who were in that category were shifted to another level of Poorer which was 5% in 2015 but in 2016 it was pushed to 12.20 %.

Table 6: Category of poverty

Category	Destitute	%	Poorest	%	Poorer	%	Other	%	Total
2015	17	5.57	111	36.39	173	56.72	4	1.31	305
2016	0	0.00	88	28.85	57	18.69	160	52.46	305
2017	7	2.30	90	29.51	147	48.20	61	20.00	305
Total	25		289		376		225		

Source-field research, 2019

It should be noted that because there is no other category to shift to, the category “others” does not change, it remains 61 people because there are Local Leaders, employee in headquarters or in VUP Sector. Overall, VUP’s graduation rate is evidence of positive outcomes on poverty alleviation. Furthermore, the presence of cross-cutting issues and outcomes is clearly evident. However, examining VUP at a more granular level indicates some serious shortfalls in outputs. The most drastic of these shortfalls lies in the Financial Services component. VUP has spurred significant poverty reduction in BUGESERA District but hard in extreme poverty matched the average, it lagged in the growth of its Middle Income population.

impact on beneficiaries as we are going to show in following paragraphs. A good number of beneficiaries had acquired a lot of assets such as houses, plots, animal husbandry. All the beneficiaries of VUP have accounts in banks or Umurenge SACCO. To be paid via bank account is very secure that being paid in cash as it reduces the risk of losing the money. VUP also helps the beneficiaries to be familiar with banks and monetary institutions. Moreover, it helps them to save.

4.2.4 Impact of VUP action on beneficiaries toward poverty reduction

VUP target the poorest people which have nothing to survive and in this research, we found out that VUP has a considerably

4.2.4 VUP Outputs and Impacts by component

4.2.4.1 Public works

In 2015, Public works was the operational component, and had more than 47.10% beneficiary households on different projects.

Table 7: VUP Impact by Components

Component	2015	2016	2017
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	Allocation	Execution	Allocation	Execution	Allocation	Execution
Public	43,000,000	31,542,000	148,250,490	147,877,000	105,722,028	92,354,450
Works						
Direct	143,000,000	131,542,000	7,218,000	7,334,315	21,280,800	21,061,200
Support						
Financial	0	0	71,020,936	71,020,936	42,334,276	42,333,000
Services						
Total	186,000,000	163,084,000	226,489,426	226,231,251	169,337,104	155,748,650

Source: VUP Data Base VUP Bugesera 2019

VUP employed a great number to work on the project of environmental protection were many especially making terraces and fighting against erosion. 59 percent of plans in 2015 to 73 percent in 2015/2017. Another activity in VUP is road making. The activities were diversified over period of time. The new project that was put into practice 2015/2016 were the school construction, markets construction, infrastructure, and increased finance, construction of bridges and cultivation of crops.

During the January-June 2015 mini-budget year, transfers were made of 143,000,000 Rwf to the beneficiaries regarding to the sample size. This was decreased to 7,218,000 Rwf during the 2015/2016 financial year, which also increased to 21,280,800 Rwf for the financial year 2016/2017, however, as there are families which are poorer, no surprise if they are helped. The poorer families with no capacity to including those in old age, disabled and chronically sick people without forgetting child-headed families. The launch of financial services component was held in January 2015 and VUP, administrative staff at cell and sector levels were trained in Ubudehe Credit Scheme/Financial Service design and procedures.

The first loans were disbursed in March 2016. The form and size of loans given out in fiscal year 2015/2016 where BUGESERA District gained 71,020,936 Rwf. The type of loan given was individual 69 percent and group loan 30 percent and then cooperative loan 1 percent. The total amount of beneficiaries equal to 76 percent. Agriculture, livestock and trade are considered as the basic income generating activities. Other kinds of activities includes non-agricultural trade, hand craft, tailoring and fishing to increase the access to money for poorer families is one of the objectives of VUP. FS programmes are provided mainly to groups rather than individuals, and recipients must present projects to a committee for review, and have a SACCO account. Each sector in a district has an amount of funds to disburse for FS, and sends out a call for proposals. Because the amount given to groups is higher than that for individuals, some form groups to access the higher amount and then fold following the receipt of funds. Initially, the requirement to repay the loan was not very clear to recipients. Many beneficiaries treated the loans as grants. A key challenge in this respect is that VUP staff are also responsible for monitoring loan repayment. Given the wide range of duties of VUP staff, this impacts the efficiency of monitoring. Local authorities, like the SACCOs, do not always feel a sense of ownership towards the VUP FS funding, given its external nature. As a result, they are not sufficiently committed

to ensuring its recovery. This, combined with a lack of knowledge (or willingness) among beneficiaries regarding the requirement to repay the loans adds further pressure to the problem of repayment.

5.2 CONCLUSION AND RECOMMENDATIONS

As conclusion, this chapter shows that programme of Vision 2020 has actively contributed to the social economic development of its beneficiaries for the purpose of poverty reduction. The programme of VUP has played a vital role in financial transformation, improving standard of living, and easing access to health care through various projects implemented with targeted to eradicate the poverty for the poorest sectors. Government of Rwanda, has played an enormous effort not only to help poor peoples on financial issues but also boost their mind for shifting the agriculture jobs with non-farming jobs. As it was indicated, the big number of respondents have supported the positive change in their socio-economic development situation after implementation of the program of Ubudehe. This shows a vital role played by the programme of Ubudehe in socio-economic development of its beneficiaries in helping them to cover the basic needs such as health insurance, school attendance, improving their income, savings, standard of living. The programme of Vision 2020 has changed significantly the condition of living of Bugesera District where some residents were hardly paying basic needs such as; medical insurance and materials for children school attendance in basic education and they have arrived at covering some basic needs through income generated by Ubudehe projects.

Having growth of economy, the country should be able to fund the construction of roads and other infrastructures and lead to the opportunities to different trade activities and thereby the reduction of poverty. This intervention should have the ability to foster working productivity growth because better-quality of employees would be more voluntarily offered, while at the same time marketing infrastructure would be improved. In addition, different poverty reduction strategies can be adopted. Analysis should provide clear information on the household, such as the head of the family, the sex of the head, the age of the head, and those who are able to work, those who have daily jobs, the number of hours they work and the amount of money they earn.

Development of economy is necessary but unfortunately there are no enough materials to generate broad strategies for reduction of poverty in Rwanda. Stakeholders and the Rwandan

government should not only focus on the development of social services but also on the development of agriculture and other small business enterprise. The government should also be sure that it has economic integration with other countries so as to make the business easy. The vision 2020 programme is nowadays reliable way for identifying the needs and priorities of the citizens. Therefore, it was the channel the planners have to consider while making the allocation of money in different activities for the communities. The mechanism used to respond to the issues in the communities and the individual poverty is known as VUP. In the expansion of VUP, the focus in the districts should be the poor families, they should be given funds to start small businesses, to be trained on how to start business trained and how to save for the future.

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Obstacles to Political Development in the Post-Taliban Period in Afghanistan: An Analytical Study

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DOI: 10.29322/IJSRP.10.09.2020.p10599

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p10599>

Abstract- After the Second World War, political development has become the core topic of political science and sociology studies and interestingly, several studies indicated that political development positively had affected on the socio-economic development of developing nations. This section outlines the proposed methodology for the study. The present study is designed to identify the key obstacles facing political development in the context of Afghanistan between 2001 to 2018. This study is planned as a qualitative method and based on available literature review. Keeping in view the nature of research of the problem and question, the efforts have been made to collect material from diverse sources. Thus, there is a combination of primary and secondary sources. Information will be collected from documents such as the International agencies organization, books, journals, speeches, statements and official declarations and communications. The findings of this paper show that the lack of security, poor economic, lack of political commitment, ineffective governance, highly centralized government, political instability, and more importantly rampant corruption is the main obstacles to political development in the context of Afghanistan in the Post-Taliban period. Moreover, political development has not taken place properly in the post-Taliban administration. Last but not least the result of this study will be fruitful to the present and future government of Afghanistan in order to find out possible solutions to the political development.

Index Terms- Political Development, Afghanistan, Security, Corruption, Development.

I. INTRODUCTION

Political thinkers and economic scholars have different points of view on political development. It is the belief of this study that there is no broad consensus about political development among social scientists so far. The literature review shows that political development is prerequisite for the economic growth, increasing popular participation and building up the government capabilities of developing countries. Today, Urbanization, a shift of the population from a rural to an urban society, is an outcome of social, economic, and political developments that lead to immense pressure on the natural and built environment. Whereas

Afghanistan is a traditional and complex society to govern with so many ethnic classes. William Maley (2011) stated that despite rampant corruption and insecurity, Afghanistan encounters with number of problems including poor governance, lack of popular participation in macro-issues (elections), shortage of political instability, real conflicts of interest, and parallel and potentially conflicting systems of authority, nepotism, and these problems have affected the path of political development in the context of Afghanistan. **Ben Smith (2011)** stressed that the centralization of political power and administrative authorities and the ineffective public sector organizations are considered to be the key obstacle to political development in the Post-Taliban period in Afghanistan. In addition to this, he further states that the president has broad powers under the Constitution, being commander-in-chief of the Afghan armed forces and empowered to inaugurate the parliament and power is limited only in Kabul. The significance of the study lies in providing the framework of political development in Afghanistan, formulating a democratic fabric and evaluating the governance capabilities of the Afghan society. This will help policy makers in addressing the challenge in order to make a conducive environment for political stability and political development in Afghanistan. It may be made clear here that it does not provide an in depth analysis of various factors and forces. Instead, provides synoptic view of various issues and problems related to political development. It is expected that the results of this work would not only facilitate the scholars and experts of politics and civil society activism but it would be also a massive contribution for the students, and policymakers in the field of development studies.

The questions that will be addressed in this study to: How far is Afghanistan from the political development process? what are the problems to political development road in Afghanistan. This study is designed to assess the obstacles facing the political development in the post-Taliban period in Afghanistan and provide some possible solutions for the present government in order to cope up with problems that bedeviled the path of political development in Afghanistan.

II. CONCEPTUAL FRAMEWORK

Before discussing the issue of political development, this study concisely outlines the meaning of development and what

development is all about then it will help readers to understand better the political development. There are as many definitions for political development as number of economic thinkers but some key definitions are illustrated as follows: Development means "a specified state of growth or advancement; a new and advanced product or idea; an event constituting a new stage in a changing situation." (Oxforddictionaries.com) The term political development like other concepts of political science has a lack of consensus among researchers and scholars. It must be acknowledged that the term "political development" is relatively novel to political science. According to Lucian W. Pye and Sidney Verba (2015) for many people political development means primarily the prerequisite political environment essential for economic and industrial development. In sum, political development has been subsumed in the literature concerned with state-building and with democratic transitions (Fukuyama, 2004; Maley, 2006).

III. OBSTACLES TO POLITICAL DEVELOPMENT IN AFGHANISTAN

Obstacles to political development in the context of Afghanistan is a controversial and complex issue. There many barriers facing the political development road in Afghanistan including the problem of drugs, the situation of women, poverty, political and administrative corruption, and cultural problems and the inadequacy of the media, insecurity, religious extremist values and more importantly, unfinished ethnic conflict. Despite the fact that in contemporary Afghanistan, various measures have been taken by various political currents for the political development of this country, but so far, no good record has been presented in this regard. It seems that there are various obstacles to political development, and ethnicity is the most important challenge to political development.

1.1 Poor governance as a main problem to the political development road in Afghanistan:

"Good governance implies presence of rule of law, safeguard of human rights, and existence of honest and efficient government, accountability, transparency, predictability and openness" (Pierre Landellmills and Ismail Serageldin,1991). Whereas lack of good governance can be remarked as main problem to political development in Afghanistan. In addition to this, several political and economic commentators believe that rebuilding political institutions in developing nations in general and particularly in Afghanistan is extraordinary difficult task, for which the government of developing nations require considerable and sustainable amount of technical and financial foreign aid for the period of time (Chris Johnson, William Maley, 2003).

1.2 Corruptions as main problem to political development:

Insecurity, corruption, narcotics and poverty have been considered the main problems in the post-Taliban period in Afghanistan. Meanwhile, the phenomenon of "corruption" is a serious threat to Afghanistan; Because a large part of the insecurity, the increase in cultivation and production of narcotics and the slowness in improving the economic situation and livelihood of the people, is due to corruption. There is no doubt that corruption is a global issue and no society can be safe from

corruption and its consequences. Several studies indicate that corruption is the single greatest obstacle to economic and social development around the world. Every year \$1 trillion is paid in bribes while an estimated \$2.6 trillion are stolen annually through corruption a sum equivalent to more than 5 per cent of the global GDP. Shortly, corruption is perceived the main barrier to political development in the context of Afghanistan. widespread corruption adversely affected governance quality, can fuel organized criminal networks and promote crimes such as human trafficking, arms and migrant smuggling, counterfeiting and the trade in endangered species in the country.

3.3 Centralization of political and administrative power in Kabul can be considered as main obstacle to political development

The economic system, quality of life, educational set up, healthcare sector and political process has significantly changed after the removal of the Taliban from the power in Afghanistan but there are many challenges, including lack of political set, poor governance, fragile economic system, corruption and so forth. Ivan Safranchuk (2017) stressed that centralized political set up in Afghanistan not only greatly intensifies the political competition but also increases the cost of holding the country together.

1.3 Misunderstanding of political development among political elites

Review of literature indicated that political development is a more elusive among political elites in the context of Afghanistan. The meaning and the conceptualization of development was greatly influenced by the ideological contradiction between the western educated and scholastic scholars. Western educated believe that political development plays very crucial for promoting democracy, human rights, good governance, citizens participation in public affairs and more precisely democratic Afghanistan, in contrast, scholastic scholars perceived or considered the political development as threat to indigenous values in Afghanistan and they posed number of challenges the road of political development. The concept of political development has not been internalized among Afghan political leaders and more precisely warlords strongly reject the political development in Afghanistan and they believe political development is more western oriented.

3.5 lack of citizens trust seems as main obstacles to political development

The erosion of confidence between the government and citizens is a systematic of a deeper challenge, rather than the problem itself. Today Afghan people despite multiple reasons are losing their faith in government. The growing trust deficit between the people and the government, particularly on governance, rule of law and the economy as well as public service delivery is still in very high scale. All in all, trust of people is the greatest social capital for the strengthening the road of political development in developing nations in particular Afghanistan. In contrast, today lack of trust in government is a major threat.

1.4 lack of national identity in Afghanistan,

Without a national identity, speaking of political development is undoubtedly an exaggerated and baseless claim. A society will never be able to achieve political stability and development until it reaches the stage of formation of national identity and does not go through the structures and ideas of pre-nationalization. Acquisition of national identity and manifestation of national will and desire are considered as the primary and basic signs of political development in any country.

1.5 lack of unified consensus among Afghan leaders on political development,

Review of literature stated that one of the important challenges in the path of political development of Afghanistan is the lack of public consensus among the diverse population of this land. However, after the fall of the totalitarian rule of the Taliban, the conditions were created for the tribes and inhabitants of this land to move towards a grand consensus in an atmosphere away from war and tension. But unfortunately, after a short time, the political and managerial process of the country returned to its former orbit.

3.6 Imbalance of resource distribution in Afghanistan

The imbalance in the implementation of development projects and the allocation of budgets is the main problem to political development in Afghanistan. For example, in certain districts and provinces, due to special tendencies, despite the lack of public acceptance of the reconstruction process or the domination of the opposition in those areas, it is tried that international aid and development programs are drawn and allocated to those areas at any cost.

3.7 Lack of security as main challenge to political development

Lack security is the greatest challenge to the road of political development in Afghanistan. majority people in Afghanistan claim that murder cases, target killing, and armed robberies almost every night across the country is rising.

According to Thomas Hobbes (1996), security is the core responsibility of the state. The primary purpose of government is to provide security and welfare to its people. Unfortunately, the Afghan government has failed to provide a secured and safe environment for lives, properties and the conduct of business and economic activities. The alarming level of insecurity in Afghanistan has fueled the crime rate and terrorists' attacks in various parts of the country, leaving unpalatable consequences for the nation's economy and its growth. Most of commentators and scholars who have research and studied about the insecurity causes in Afghanistan demonstrated that despite many attempts, the level of insecurity in the country is very still high, and a confirmation of this is the low ranking of Afghanistan in the Global Peace Index.

Almost 19 years have passed since the removal of the Taliban from the power, but peace remains great dream for every Afghan-individual in Afghanistan and persisting insecurity continued to be the main challenges to the political development and as well as to the stabilization efforts in Afghanistan.

3.8 Socio-cultural barriers to the political development

Afghanistan was always divided into distinctive communal, ethnolinguistic, and religious groups. Moreover, these groups possessed a social system that emphasized loyalty to the local

social group (qawm) rather than a higher-order abstraction like the state. The geographical barrier set by the Hindu Kush Mountains created a barrier between Kabul and the rural areas and retarded the development of centralized political institutions, which could only expand in power at the expense of local loyalties (Larry Goodson,).

3.9 Ethno-religious conflicts as key challenge to political development

Today ethno-religious conflict is the main source of problem in Afghanistan and it adversely affect on the process of political development. thus, the new political system propped up by Washington and its allies aimed to balance ethnic relations and prevent a renewed conflict by ostensibly attempting to make the new political system more representative, open and a level playing field for all Afghans. Some of the past discrimination against certain minorities was abandoned. However, the centralized system failed to deliver governance at subnational level.

Some of these critical shortcomings were papered over by more informal means, such as elite alliances and patronage politics, which serviced those in power but delivered little in the way of political stability and development.

A big part comprised of deal-making, in which appointments to key posts amounted to a distribution of political spoils. This went against the demands of many Afghans, who called for a meritocracy and for transparency (Siddique, 2012).

3.10 Lack of strong political parties as key barrier to political development

In the absence of strong pluralistic and democratic institutions to mediate internal tensions, political bargaining and the competition for power will most likely continue to occur outside the institutions of government. Because of their past shortcomings, however, many Afghans regard political parties with suspicion. Yet, post-Taliban Afghanistan has witnessed the emergence of many small democratic parties that offer a break with this past, and the means to create a stable and democratic parliament. And many Afghans, especially young people, now recognize parties as an essential component of the legal democratic process.

IV. RESULT

One of the important political and social issues that is widely discussed today and discussed in scientific and political forums is the issue of political development. The past three decades of war and disorder have had a devastating impact on the Afghan people. Millions have been killed, millions more have been forced to flee their homes and the country's infrastructure and forests have all but been destroyed. The social fabric of the country is fractured and state institutions are fragile and weak.

William Maley (2011) in his paper entitled "Challenges of Political Development in Afghanistan: Mass, Elite and Institutional Dimensions" states that despite insecurity and corruption, Afghanistan suffers from number of other challenges such as the trust deficits, real conflicts of interest, and parallel and potentially conflicting systems of authority, nepotism and

poor governance, have affected the path of political development in the context of Afghanistan.

Development's policies are based on a set of premises: state-building, state of law, democratization, accountability and privatization. The idea is that the political development could be implemented through the 'civil society' of the building from scratch of new institutions. Such a model works when there is political will from the local political authorities and the society to adopt such a model. But in any case, a policy of development should be based on political legitimacy. The result of this paper indicates that political development has not taken place in Afghanistan and there are many challenges facing the political development in Afghanistan.

V. CONCLUSIONS

There are various perceptions regarding According to some researchers, political development is the political methods and policies that facilitate economic growth in developing countries. Other scholars have focused on the political development of new regimes, the expanded role of governments, increasing political participation, and the ability of regimes to maintain order in the face of rapid change, as well as competition between political groups, classes, and ethnic groups. They define power as well as competition in social status and wealth. For others, political development is how revolutions take place, especially the conditions for the replacement of capitalist or socialist systems. In sum, there are many reasons why actualizations of political development is unproductive and the government failed to hold accountable for the citizens and donor community. Despite all these, foreign aids are only conditional on Afghanistan agreeing to accountable, effective, transparent, sound public sector organizations and as well as to implement a reliable anti-corruption strategy that is in accordance with law.

VI. RECOMMENDATION

There is a clear consensus that political development is indispensable for socio-economic and cultural betterment of Afghanistan. political development promotes the institutions, judicial, administrative, economic, and social rules and protection of human rights, respect of the rule of law, and ensure that people are free to participate in those issues that affect their lives.

- In fact, political development is essential prerequisite for any country's development and to make the state and the political system workable and suitable for the people.
- To bring political development in Afghanistan different government organization should empower economic, social and political

development in networked way, by making healthy communication from top to bottom accordingly in hierarchy of the power distribution.

- International and national actors should work together on the curtail of challenges of political development in the context of Afghanistan by providing different research, advocacy, consulting ensuring accountability, rule of law, and transparency of different government organs.
- Empowering different stakeholders for instance civil societies, political parties, governmental and nongovernmental institutions, pertinent to Promoting the indigenous values identified with governance practices in Afghanistan.

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Enhancing Students' Participation in Classroom Group Discussions: An Action research project on University Students

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DOI: 10.29322/IJSRP.10.09.2020.p105100

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p105100>

Abstract

The objective of this action research project was to investigate and mitigate the challenges that hamper first year university students' participation in group discussions with the intention of enhancing their involvement in group discussions by taking relevant measures against the problems that were identified through different means. Methodologically, twenty six students and six instructors who had courses to the target students took part in this action research. Questionnaire and observation were used to identify the problems affecting students' involvement in group discussions before interventions and after the implementation of the proposed actions. Based on the identified problems, intervention actions were proposed and carefully implemented gradually and rigorous evaluation was made. Then, the evaluation indicated that students had significant improvement as a result of the interventions made. The findings of this project indicated that if instructors/teachers take actions with proper considerations, their instructional practices can be tremendously improved.

Key words: *action research, group discussion, intervention*

Introduction

Countries use various effective education policies to make their learners actively involved in the process of teaching and learning process. Ethiopia is implementing a teaching learning policy on the basis of student centered approach at different school levels. Among others, Assosa University is one of higher education institutions which are conducting teaching learning process within different programs based on active learning philosophy. There are various actors who play major roles in this process such as administrators, instructors and students. In order to insure this, instructors are expected to use different active learning methods including group discussions. However, many students appear to be reluctant and passive to involve actively in group activities. This was evident from the ideas reflected by different instructors who had courses to teach in this institution.

Student's participation is a key element for effective group learning to happen in the classroom. For this reason, students were given various group discussion activities to be completed in cooperative manners. Nonetheless, greater parts of the group work that are provided by the course curricula were mostly dominated either only by some students or majority of the group members were silent. That situation created a question that call to answer for why do majority of the learners don't take part in group discussions.

In the contexts of university teaching, the notion of action research emphasizes the application of instructor's intelligence and specific remedies to alleviate immediate and specific problems which the instructor faces in his/her day to day teaching activities. Accordingly, this action research project was initiated and attempted to search for the causes for passive involvements of first year students in the department of English Language and Literature in group activities. Conversely, this project endeavored to identify and apply actions that can improve and enhance students' participation in group discussions. This action research specifically attempted to answer the following research questions:

1. What are the causes for the target students' less participation in group works?
2. What possible actions can be taken to improve students' involvement in group discussions?

The major objective of this action research project was to improve students' participation in group discussion. Specifically the project attempted:

- ✓ To find out the major causes for less participation of students in group discussions.
- ✓ To explore and apply essential measures which improve students' participation in group discussions.

This action research project would provide important inputs to enhance the teaching learning process. Therefore, students would become active participants and the instructors would improve their use of active learning methods which would ultimately enhance students' engagement in the teaching learning process.

2. Literature Review

There has been a great deal written educational studies about the importance of student participation in the classroom and what teachers do to foster greater participation specifically in group discussions. Accordingly, this brief literature review would focus on the importance of group discussion, facilitating group discussions, assigning roles for students in group discussions, and factors that affect students' participation in group discussions.

2.1. Nature and Importance of Group Discussion

Like other methodologies group discussions have both limitation and strengths. Several problems can be encountered when using group discussions in the classroom such as difficulty to get students participation, being more time consuming, requirement of more forethought than lectures, being not well suited to covering significant amount of contents, and existence of less instructor control.

Despite this nature, discussions approaches are well suited to a variety of course goals including the following. First, discussions provide the instructor with feedback about student learning. Second, discussions are suitable for higher-order cognitive objectives: application, analysis, synthesis, evaluation (Blooms 1978, cited in William and Philip, 1986). Third it is suitable to affective objectives: to develop interest and values, and to

change attitudes. Fourth it makes students become active participants. These things ultimately boost their motivation and make learning more interesting.

2.2. Facilitating Group Discussions

One of the basic components of effective group discussion is related to facilitating the students and the task in various aspects such as preparing for discussion, starting the discussion, encouraging students' participation and guiding the discussion. Here are some strategies that help to prepare for and lead an effective discussion which is adapted from (Kustra & Potter, 2008).

2.2.1. Preparing for a discussion

At preparation stage facilitating group discussions incorporates consideration of the different issues. The first thing is to plan how to conduct the discussion. Next, is to help students prepare for the discussion. In addition to these, clearly communicating how much time you have for questions or discussion and what you are looking for from this time are also important parts of preparation for discussion. Similarly, asking students to state their name before they begin speaking and keeping background noise to a minimum among the aspects of facilitating group discussions before starting the actual group activities. (Ibid)

2.2.2. Formulating ground rules

Ground rules are a set of guidelines describing behaviors that may improve a group's process. Usually the facilitator presents these basic agreements as a proposal at the start of the group's first meeting. Once they are accepted, it is the job of the facilitator to see that the group respects these norms. The next are ground rules by (Beatrice, 2013)

- Everyone participates
- Speak only for yourself
- No interrupting
- Seek a solution
- Begin and end on time
- Have an agenda and stick to it
- One speaker at a time
- Listen with respect
- No personal attacks or blaming
- Confidentially (when appropriate)
- Alternate men and women speakers

2.2.3. Starting a discussion

Facilitating group discussion, while starting group discussions, also requires instructors to accomplish different tasks. The issues considered at this stage include:

- ✓ Refer to questions or issues you distributed.
- ✓ Make a list of key points.
- ✓ Use a partner activity.
- ✓ Pose an opening question and give students a few minutes to record an answer.
- ✓ Divide students into small groups to discuss a specific question or issue.

- ✓ Pose a controversial issue and organize an informal debate. (Kustra & Potter, 2008).

2.2.4. Encouraging student participation

To encourage student participation, creation of an inclusive discussion environment is vital. Group members will be more likely to contribute to a discussion if they feel they are in a safe, comfortable environment. The strategies for achieving this are use of an icebreaker activity and to ask students to introduce themselves and interests and backgrounds, to learn all of your students' names, and to arrange the seating in the room, if possible, into a semicircle so that the group members can see each other.

The other issues that encourage student participation are allowing students to ask questions or share ideas in class, giving students low-stakes opportunities to think and discuss content – this is a "tolerance for error" approach, facilitating smaller discussions among students before you ask students to share with the entire class and facilitate smaller activities before discussion and questions start, so that students have time and space to compose their ideas. (ibid)

Moreover, scholars advise to have students take turns writing down questions and answers on whiteboards or on large flipchart paper and then to post the notes around the classroom for future reference. Besides, positively reinforcing student contributions, limiting your own involvement and maintaining appropriate silence in the classroom are also important aspects. Additionally, having a balanced student's voice during the discussion is also vital for maintaining active student interest and involvement.

2.2.5. Guiding the discussion

The other aspect of facilitating group discussions is concerned with what to do when guiding the discussion. Tasks of the facilitator at this stage include: keeping the discussion focused, repeating the key point of all comments or questions for the rest of the class, taking notes, and being alert for signs that the discussion is deteriorating. Besides, preventing the discussion from deteriorating into a heated argument, bringing closure to the discussion and recalling that not all students are comfortable with extended direct eye contact are also issues that should be addressed when guiding the discussion. (Kustra & Potter, 2008)

2.2.6. Evaluating the discussion

The last task of facilitating group discussions deals with assessment of how effective the discussion was and how much did students understood the objectives of the discussion. Some of the tasks include asking students to write a one-minute paper, asking students to respond to specific questions about the discussion, and conducting your own informal evaluation of the discussion. (ibid)

In general, the aforementioned tasks are done before, during and after discussions to facilitate group discussions. Therefore, facilitators should consider which activities are effective, which students are in good progress and which ones are behind, and take the necessary measures by reading the given discussion context. The overall effects of these tasks will ultimately aid facilitation of group discussions.

2.3. Roles Students to Play in Group Discussions

Roles in groups are traditionally divided into task and maintenance roles. Task roles help the group make progress and move towards achieving goals; and maintenance roles help the group build or sustain a sense of community and cohesion (www.turning-the-tide.org). Everyone in the group plays one role or more either consciously, though more often unconsciously. The challenge for facilitators is to recognize and manage all the roles and fill the

appropriate one when necessary. The next tables illustrate the roles, purposes and techniques in both task and maintenance roles which are adopted from www.turning-the-tide.org.

Table 1. Task Roles - help the group makes progress and move towards achieving goals

Roles	Purpose	Technique
<i>Initiator</i>	Gives direction and purpose to the group	Proposing, goals; defining problems; suggesting procedures
<i>Information seeker</i>	Makes group aware of need for information	Requesting relevant facts; asking for clarification
<i>Information-giver</i>	Provides group information relevant to its work	Offering relevant facts, avoiding reliance on opinions when information is needed
<i>Opinion-giver</i>	Provides basis for group decision	Stating feelings, beliefs and evaluating a suggestion
<i>Clarifier</i>	Eliminates confusion about the current task	Defining, interpreting; identifying issues & alternatives
<i>Elaborators</i>	Reduces ambiguity, synthesizes information	Giving examples, developing plans and explaining
<i>Harmonizer</i>	Adjusts or harmonizes issues, ideas, proposals that may conflict	Suggesting ways that different issues can be handled, new ways forward
<i>Process-organizers</i>	Establishes an order to the meeting	Suggesting agenda items, procedures, where to go next
<i>summarizer</i>	Shows how ideas are related; draws ideas together	Pulling together related issues, showing contradictions, restating suggestions
<i>Philosopher/critic</i>	Shows that a certain issue is not unique; inserts views from similar experiences	Drawing general reports from specific ones; critically examining assumptions & ideas (not people!)

Table 2. Task Maintenance Roles - help the group builds or sustain a sense of community and cohesion

Role	Purpose	Techniques
Encourager	Brings out others' opinions & gives others credit	Being friendly, responsive & accepting others' inputs
Feelings-expresser	Calls group attention to reactions to ideas and suggestions made	Expressing own feelings and restating others' feelings
Tension-reliever	Reduces tension; allows group to express its feelings	Joking, clowning; suggesting breaks or exercises/games
Mediator/ Harmonizer	Maintains group cohesion; reconciles disagreements	Offering or accepting compromises; admitting error; supporting reconciliation of differences
Facilitator	Maintains open discussion;	Drawing out silent members; suggesting procedures

	keeps idea flowing	
Standards-setter	Makes group aware of direction and progress	Expressing the group concern; suggesting tasks; stating standards and goals for the group to achieve
Interpreter	Explains what someone has said; helps others to understand each other	Paraphrasing or summarizing speakers' contributions
Follower	Provides stimulating & interested participants	Accepting ideas of others; going along with the group
Agreement-Tester	Finds out how close the group is to agreement	Noting progress; stating areas, making proposals for group reaction; asking if agreement is likely
Evaluator	Keeps group in line with goals	Measuring accomplishments against goals
Time-keeper	Keeps the group on track in terms of agreed schedule	Noting the time and suggesting what next

Among the vital skills for a facilitator is to learn and constantly sharpen the ability to identify and fill functions as needed, or point them out to the group. It is also healthy to rotate particular roles so that the students can have a broader understanding of how all the parts fit together to make a whole. Generally, dividing up these roles can add a great element of cohesion to the group.

2.4. Factors that Affect Students' Participation in Group Discussions

Various factors may affect students' participation in group discussions which may be related to different causes. Various potential problems may be stated in relation to students. To mention few, the participant who talks too much, the member who will not talk and the discussion that turns into an argument are some of them. In addition, unclear or hesitant comments, the discussion that goes off track, the student who attacks the facilitator and other students are also the other factors that affect group discussion. www.cirtl.net/diversity/resources/

In good discussions, conflicts, ambiguities, arguments and so on will sometimes arise. If such conflicts are left ambiguous, they may cause continuing trouble. Therefore, the facilitator could minimize effects of these problems using various ways to handle these situations including confrontation, active listening, locating, reframing and deferring.

Generally, maintaining discussions often means dealing as smoothly as possible with the problems that arise. Hence, the facilitator can take a strong position as moderator, preventing participants from interrupting each other or speaking simultaneously. These could be tackled by setting ground rules for discussion, such as asking participants to focus conflict on ideas rather than people and to resist being judgmental.

3. Methodology of the Study

This action research was conducted on students of first year English Language and Literature Assosa University. The rationale behind selecting the department was the researcher's perceived and practical problems in his teaching experiences at the university and in the above stated program.

3.1. Sample Population and Sampling Techniques

The subjects of the study were fifty two students from first year Agribusiness and Value-Chain Management Program and six instructors who gave different courses those students. Twenty six students were selected as a

sample using random sampling technique, and six instructors were selected using purposive sampling technique.

3.2. Data Collection Instruments

Due to its convenience to collect data needed for the project, observation and questionnaires were employed as primary data collection instrument to collect data in this action research project. Accordingly, both open-ended and close-ended questionnaires items were prepared and administered on students and instructors to get insights into what factors affect students' participation in group discussions. Besides, observation checklist was prepared and used to observe and analyze the students and teachers activities during group discussions in the actual classroom sessions.

3.3. Techniques of Data Analysis

Both qualitative and quantitative methods were employed to analyze the data collected through open-ended and close-ended questionnaire. The data emerged from the questionnaire was organized and tabulated. Then, meaning resulting from the analyses was interpreted using percentages. Finally, similar patterns and themes were categorized from both questionnaires and the core findings drawn from the two questionnaire items were narrated qualitatively.

3.4. Initial Findings

Various questions with the target of identifying factors affecting students' participation in group discussions were provided to both students and instructors using open-ended and close-ended questionnaires. Accordingly, the findings emerging from both questionnaires are discussed in the succeeding parts.

Table 3. Results from close-Ended student Questionnaire

No	Items	<i>Responses, frequencies and percentages</i>											
		Response	Frequency	%	Response	Frequency	%	Response	Frequency	%	Response	Frequency	%
1	Do your instructors give you group activities?	Yes	24	92	No	2	8	-	-	-	-	-	-
2	How often do your teachers give you group discussions?	often	5	19	sometimes	17	65	Rarely	4	15	Never	0	0
3	What do your teachers often do when they give you group works for discussion? (more than one option is applicable)	Giving instructions	6	23	Checking & evaluating answers	9	35	Receiving answer	7	27	Clarifying & giving support	4	15
4	How often do your teachers encourage you to involve in group works/discussions?	often	3	12	sometimes	10	38	Rarely	13	50	Never	0	0
5	Do your teachers assign roles to you (e.g. chairperson, secretary, time keeper...) while you discuss in groups?	Yes	5	19	No	21	81	-	-	-	-	-	-
6	How often do your teachers assign roles to you group discussions?	Often	0	0	sometimes	0	0	rarely	5	19	Never	21	81
7	How often do your teachers give you enough time during group discussions?	Often	4	15	sometimes	12	46	rarely	10	38	Never	0	0
8	What do you think about learning & sharing knowledge in group discussions?	very important	6	23	Important	9	35	Less important	8	31	Unimportant	3	12
9	How do you feel about participating in group works/discussions?	very important	5	19	Important	4	15	Less important	11	42	Unimportant	6	23

10	What do you often do when you are given group works in the classroom?	participating actively	3	12	Listening to others	15	58	Doing other things	4	15	I don't do anything	4	15
11	How many students do often involve when you discuss in groups?	all	0	0	Many	4	15	some	16	62	very few	6	23
12	How often do you actively participate in group discussions/works in the classroom?	often	5	19	Sometimes	9	35	Rarely	10	38	never	2	8

Table 4. Results from close-Ended Instructor Questionnaire

No	Items	<i>Responses, frequencies and percentages</i>											
		Response	Frequency	%	Response	Frequency	%	Response	Frequency	%	Response	Frequency	%
1	Do you give you group activities in the classroom?	Yes	6	100	no	0	0	-	-	-	-	-	-
2	How often do you give group discussions?	often	2	33	sometimes	3	50	rarely	1	17	never	0	0
3	How do you rate students' involvement in group discussions?	Very active	0	0	active	0	0	to some extent active	2	33	passive	4	67
4	How many students do often involve when they discuss in groups?	all	0	0	many	0	0	some	5	83	very few	1	17
5	How often do you assign roles to students (e.g. chairperson, secretary...) when they discuss in groups?	Often	0	0	sometimes	1	17	rarely	3	50	never	2	33

6	What do you often do with students when you give them group discussions?	let them discuss & find out without any interference	3	50	check & clarify the issue with every group	1	17	i hear what they say and give feedback	2	33	others (please specify)	0	0
7	How often do you give encouragement and ample time during group discussions?	Often	2	33	sometimes	3	50	rarely	1	17	never	0	0
8	What do majority of students often do when you give group works in the classroom?	participating actively	0	0	listening to others	5	83	other activities	1	17	nothing	0	0

NB: '- - -' Means not concerned

Table 5. Results from Observation before intervention

no	Items	observation frequency											
1.	Does the instructor give group activities?	yes	✓	No									
2.	How often instructor give group discussions?	often		sometime		rarely	✓						
3.	Number of students often involved when they discuss in groups.	all		many		some		few				✓	
4.	Activities students often do when they are given group works.	participating		listening to others	✓	doing other things		nothing					
5.	The extent of students' involvement in group discussions.	very active		active		to some extent active		passive				✓	
6.	Frequency of teachers' encouragement to make students involve in group discussions.	always		Often		sometimes	✓	rarely					
7.	Tasks teachers often do with students when they give group discussion.	Giving instructions only	✓	asking for & receiving answers		clarifying/giving support							
8	The extent of teachers' assignment of roles to students (e.g. Chairperson, secretary ...) in group discussions?	often		sometimes		rarely		never				✓	

3.4.1. Findings from the Close-Ended Questionnaire and observation

Different questions which aimed at finding out the factors that affect students' involvement in group discussions were provided to both students and instructors in open-ended questionnaires. Accordingly, the findings emerging from the close-ended questionnaires are discussed in the subsequent paragraphs. The first question asked in the close-ended questionnaire was about whether instructors give group discussions to the students. Accordingly, the data from both students and instructors confirmed that instructors provide students with various group activities. However, the frequency in which students are provided with such discussion activities is less. This is to mean that 33% of the sample data shows as the students were passive in group discussion. Besides, 83% of the respondents responded that majority of the students do not take part in group discussions.

Students were also asked to reflect on their feeling about participating in group discussions; and the data obtained from them generally indicated that majority of the students perceive group discussion as vital methodology to learn better. But, when students and instructors respond how often students actually participate in discussions, it was found that their participation is very less. Moreover, many students deal with other personal duties which are unrelated to the given discussion tasks. On the other hand, when exposing about what instructors do with students in group discussions, the data revealed that 33% of the respondents responded as the students do not get enough time, support, and encouragement. Besides, the data revealed that majority of the instructors deal with giving instructions, asking and receiving answers than facilitating and clarifying the activities. The other issue inquired was related to if instructors assign different roles to play when they discuss in groups. The data showed 50% of respondents responded as the majority of the instructors do not assign roles like chairperson, secretary, timekeeper etc. to students.

3.4.2. Findings from Open-Ended Questionnaire

Both students and instructors were asked to point out what factors affecting students' active participation in group discussions. Accordingly, fear of being mistaken before friends, domination of some students, lack of clarity with discussion issues, lack of encouragement, self-confidence, and experiences on students and sense of dependency were listed as factors. In the meantime concerning what should be done to improve participation in group discussions, both instructors and students have suggested issues related to teachers and students. From teachers' perspectives they suggested giving equal opportunity for all students, encouragement, enhancing students' self confidence in speaking and etc. On the other hand, being active participants, being disciplined, being ready to learn from others, discussing only given topics not unrelated issues, and so on are issues for raised for improvement from students' perspectives.

Generally, it was found that different challenges that are related to both instructors and students were affecting students' involvement in group discussions. Some of the factors related to students include: fear, reluctance, domination of few students, less attention, and dealing with other personal tasks. Meanwhile, lack of encouragement and support, shortage of time, focus on giving instruction and questions, not giving roles to students were some of the factors found affecting students participation. Therefore, based on recommendations from instructors, students, and the literature in the field, the following interventions were proposed and implemented while students were in the actual classroom duty so as to improve students' participation in group discussions.

4. Proposed Actions for Interventions

The objective of this action research was to improve students' participation in group discussions. For the purpose of improving students' participation in group discussions, the following intervention actions were proposed and implemented while students were conducting the actual teaching and learning practice.

4.1. Proposed actions for the problem

According to the collected data, there were various causes that affect students' participation in group discussion. Based on the objectives of this action research project, some actions were proposed that the researchers wanted to act on the problems. Among other things the followings were the major ones:

1. Properly planning the activities of the group discussions ahead
2. Creating expectation of participation and clarifying how participation influence grades
3. Assigning roles that change on other discussion
4. Discussing with instructors on roles and application of group works in the class
5. Avoiding fear and increasing students' attention and motivation with successive advice
6. Redirecting questions to other students
7. Controlling and giving attention to students activities
8. Managing the students those who have the character of dominator in group discussion
9. Giving feedback and rewarding student contributions
10. Managing problematic behavior in group discussion

4.2. Implementations of proposed actions

In order to improve the students' participation in group discussion various actions had been implemented with some instructors those who are giving the course in this semester for the targeted students, that is, Agribusiness and Value chain Managements of first year students. According to some instructors in this department, the major causes for less participation of the students were lack of group discussion experience in lower grades and lack of self-confidence. So, to overcome this problem group discussion method were mostly used by some instructors.

Firstly, the awareness' of the students were raised by discussion of instructors with the students on the significance of active involvements of students in group discussion. This is to mean that the teacher encouraged the students those who are previously passive during group discussion. This is mainly done by managing the students those who have the characters of dominator. Not only this, the strategy of rewarding the students for their contributions and giving feedback is another intervention action taken to enhance students' participation in group discussion.

Generally, all proposed actions listed above had been implemented to improve the student's participation in group discussion. These implementations of action were mostly done with the collaboration of teachers who had courses in the target students and who were members of the action learning set that conducted this action research project.

5. Findings after implementation of proposed actions

Data has also been gathered after various intervention measures had been taken place. This is mainly done through observation when the students' are participating in group discussion within different sessions. For instance, the extent of students participation was passive before the intervention, where as their involvement was improved and many students became active participants in group discussion. Therefore, the following data

from the observation depicted that there were some improvements of students in group discussion after the implementation of proposed actions.

Table 6. Results from Observation after intervention

No	Items	Observation frequency					
		all	many	✓	some	few	
1.	Number of students often involved when they discuss in groups.			✓			
2.	Activities students often do when they are given group works.	participating	Listening to others	✓	Doing other things	✓	nothing
3	The extent of students' involvement in group discussions.	very active	active	✓	to some extent active		passive
4.	Frequency of teachers' encouragement to make students involve in group discussions.	always	often	✓	sometimes		rarely
5.	Tasks teachers often do with students when they give group discussion.	giving instructions	Asking for & receiving answers		clarifying & giving support	✓	
6	The extent of teachers' assignment of roles to students (e.g. chairperson, secretary ...) in group discussions?	often	✓	sometimes	rarely		never

6. Evaluation of the action/intervention

As a result of the implemented actions, students were observed participating relatively more enthusiastically in the different group discussion activities than the previous ones. Accordingly, more activities that were suitable for group learning and that promote cooperative learning were given to students. The students were learning and sharing their knowledge and feelings freely in which they developed their speaking and self-expression skills. This was mainly evident in the data gathered after the intervention had been made and indicated in the following tables. Since the purpose of the research was to bring improvement on the students' participation in group discussions, the desired changes were gradual and many changes were observed with the actions taken in one cycle. In general, the process ultimately made the teaching learning process lively and both the students and instructors became beneficiaries of the actions taken.

Table 7. Comparative analysis of observation results before and after intervention

No	Issues observed	Before intervention	After intervention
1	Involvements of students in group discussion.	Some	Many
2	The extent of students participation	Passive	fairly active
3	Activities made by student during group discussion	Listening to others and doing other things	Mainly participating on the given topics
4	The extent to which the instructors assign roles for student	Rarely	Sometimes
5	Encouragements and support given for the students.	Rarely	Always

6	Tasks teachers often do with students when they give group discussion.	giving instructions	clarifying & giving support
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7. Conclusion

The major objective of this action research project was to improve students' participation in group discussions by identifying factors affecting their involvement and by proposing and implementing appropriate intervention. For this reason, different factors related to students and instructors were identified through questionnaires distributed to both instructors and students. Accordingly, different intervention actions that were supposed to bring about change on the identified problems were taken, and gradual improvement was observed in students' participation as a result of the taken actions. Generally, it is possible to conclude that the proposed actions were appropriate interventions to the identified problems and had brought the desired changes on students' participation in group discussions. Therefore, instructors have to always aspire for remedies to challenges they face from different obstacles hampering students involvement in group tasks.

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Reciprocal Teaching Strategy: It's Implication on Teaching and Learning the General Education Core Subject "The Contemporary World"

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DOI: 10.29322/IJSRP.10.09.2020.p105101

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p105101>

Abstract- The study focus on determining the implications of reciprocal teaching strategy on teaching and learning the subject The Contemporary World under the New General Education Curriculum. The study used a randomized pretest-posttest control group design to determine the effect of reciprocal teaching strategy on students' performances. Two groups of first year college students from Quezon City University are randomly selected to participate in this study (n=90). Using independent sample t-test, pretest results of two groups shows no significant difference on the level of their prior knowledge before the conduct of the study. After the two-week experimentation, paired-sample t-test results showed a significant improvement on the performances of the students on both groups. However, using independent sample t-test, students under the experimental group perform better than those in the control group. The study suggest that the reciprocal teaching strategy is effective in teaching the subject The Contemporary World and in improving students' performances.

Index Terms- Reciprocal teaching, Teaching strategy, Teaching and Learning, Social Science Education, Higher education

I. INTRODUCTION

Reciprocal teaching is designed to teach students cognitive strategies such as summarization, question generation, clarification, and prediction that might lead to improved reading comprehension (Marks, et al., 1993; Palincsar & Brown, 1984). This instructional style was originally developed for struggling readers (Palincsar & Brown, 1984), and it is categorized as an interactive learning, where in teachers and students take turns in sharing information that leads to a meaningful discussion and interaction. In addition, reciprocal teaching allows the students to interact not only in the four corners of the classroom but as wee as in the outside world (Palincsar & Brown, 1984).

Reciprocal teaching is characterized as a dialogue taking place between the teacher and students (or student leader and members of the group) that results in students learning how to construct meaning when they are placed in must read situations (Salehi & Vafakhah, 2013; Carter & Fekete, 2001). In 1997 Carter pointed out that in reciprocal teaching, the students learn

new information, main ideas, and arguments by using prior experience as a channel. They construct meaning from the text by relying on prior experience to parallel, contrast or affirm what the author suggests.

According to Alfassi (1998) various approach might be used to deliver the instruction but usually incorporates scaffolding, small group discussion, and the teaching of four reading strategies: (1) generating questions, (2) summarizing, (3) clarification, and (4) prediction.

According to Palincsar and Brown (1984) the components of reciprocal teaching are directly related to elements of zone of proximal development and scaffolding as described by Vygotsky in 1978. Palincsar (1998) also pointed out that the cycle of effective reading comprehension instruction starts with explicit strategy instruction delivered by the teacher. During the succeeding phase, the teacher provides different levels of support as students practice the strategy. Thus, suggesting that explicit teaching of comprehension strategies will provide a scaffold for students to begin to realize and understand the strategies used and apply them on their own learning.

Moreover, in 2013 Salehi and Vafakhah conducted a study that focus on identifying the difference between reciprocal teaching only and explicit teaching of strategies before reciprocal teaching on reading comprehension of Iranian female EFL learners. The results revealed that reciprocal teaching can improve reading comprehension of EFL learners, and explicit teaching of strategies before reciprocal teaching resulted to a more gains in reading comprehension among students at the intermediate level.

In a study conducted by Rodilil and Prastyo (2017), they claimed that reciprocal teaching method can be an alternative to help students comprehend English reading texts better and develop reading skills and habit. In addition, reciprocal teaching helps the students to remember what they have read better (Rodilil & Prastyo, 2017).

Choo et al. (2011) on the effects of reciprocal teaching strategies on reading comprehension suggested that reciprocal teaching strategy is effective and brought out a positive feedback regarding the use and effects of this strategy among the students in the experimental group. While on the other hand, the study of Reilly et al. (2013) on reciprocal teaching in Mathematics

revealed that the students in the non-reciprocal teaching group (control group) complete their test faster than the students in the reciprocal teaching group (Experimental group). However, when reviewing their responses, majority of the students in the experimental group got a correct answers as compared to those in the control group.

It is imperative to note that since the development of the reciprocal teaching strategy, various research studies have been conducted to determine the advantages and disadvantages of this teaching strategy (Oczkus, 2003; Carter, 1997; Rosenshine & Meister, 1994), and to examine its effectiveness in improving students' reading comprehension skills in the elementary level (Hashey & Connors, 2003; Hacker & Tenent, 2002), middle (King & Johnson, 1999), and high school students (Westera & Moore, 1995). However, there is a limited studies conducted in the tertiary level.

Reading is considered as one of the important skills in acquiring information from various sources across all subjects, while comprehension is considered the heart and goal of reading, since the primary goal of reading is to obtain new information and knowledge from a printed or online page. Reading and comprehension is one of the most important skills needed in understating the concepts of the subject "The Contemporary World". The subject primarily aims to develop the competencies of the students in terms of distinguishing different interpretations of and approaches to globalization, describing emerging global economic, political, social, and cultural systems, analysing various drivers of globalization, understanding national issues, and assessing the effects of globalization on various sector of the community. In addition, the subject "The Contemporary World" aims to develop the students' skills in analysing contemporary news events in the context of globalization, globalization in general and global issues in relation to Filipinos and the Philippines in particular. For the students to be able to grasp all the necessary information and skills from this subject, they need to develop a skill of reading and developing comprehension. Thus the researcher opted to incorporate the use of reciprocal teaching strategy as developed by Palincsar and Brown in the 1980s.

From the above surveyed literature and studies, the researcher opted to explore the effect of reciprocal teaching strategy to the academic performance of college students in Quezon City University, specifically in the subject "The Contemporary World". Thus this study primarily aims to determine whether there is a change in the academic performances of selected QCU freshmen college students who are taking up the subject "The Contemporary World" if reciprocal teaching strategy is being used. This study hypothesize that there is no significant change in the academic performances of selected students when they are exposed to reciprocal teaching strategy.

II. METHODOLOGY

The study was conducted during the first semester of the academic year 2019–2020 at Quezon City University (QCU), Quezon City, Philippines. The respondents were composed of a total of sixty (90) first year college students under the General Education (GenEd) Program of the university.

Students were divided and assigned randomly as control (n = 45) and experimental (n = 45) groups. The experimental group received the reciprocal teaching strategy during the two-week experimental procedure in the subject "The Contemporary World", while the control group received a usual lecture discussion method during the experimental period.

Week 1 and Week 2 topics and objectives found in the outcomes-based course syllabus prepared by the researcher were used and given to the students in both control and experimental groups during the experimental procedure. And before the experimental procedure, both groups were given a 30-item pretest to determine the level of their prior knowledge to the topics. The pretest was evaluated by six (6) Social Science faculty for its face validity, and a total of twenty (20) freshmen college students who are not part of the experiment took the test to determine its reliability. The test was valid based on the evaluation of the Social Science teachers and reliable as well through its Chronbach alpha test coefficient value of 0.80, which denotes that the test questionnaire has a high internal consistency.

Prior to the experimentation, the researcher selected four (4) related text that are related to the topics that will be discussed in a two week experimental period, and considered the text appropriateness to the level of the students, where they can read it even without the full supervision of the researcher.

During the implementation of the reciprocal teaching, the researcher introduced the strategy to the experimental group. The researcher provide a brief but focus introduction to the topic and link the assigned selected text to the current topic, and support them in using the assigned text and constantly monitor their progress. The diagram below shows the process where the students do during the conduct of the study.

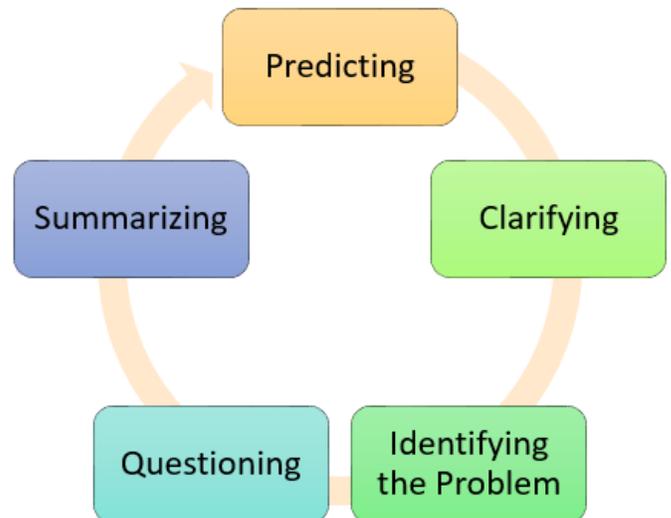


Figure 1. Implementation of the Reciprocal Teaching Strategy

In Predicting stage the researcher encourage the students to anticipate what will come next in the text, based on their appropriate prior knowledge and on the structure and content of the text. The purpose of this stage is to allow the students to confirm or reject their expectations. This promotes active thinking prior to the activity.

During the Clarifying stage, the learners are expected to deal with difficulties that they can be found or encounter in the text by noting unfamiliar vocabulary, unfamiliar structure of the text, new or difficult ideas. Clarifying and identifying the problem stage are two overlapping stages where the students find difficulties in understanding the text or connecting prior knowledge to the present situation. The teacher instructed them to write down things that they do not understand in the text or things that are unfamiliar to them. After which, the researcher ask the students to re-read, use the context of the passage, use dictionary and other reference materials, prior topics to understand the meaning of the text clearly.

During the Questioning stage, the researcher encourage the students to explore the meaning of the text in depth by asking series of questions before, during, and after reading the assigned text, and write it on their notebook. This stage allows the students to identify the kind of information that provides the substance for an appropriate question, they can also think of possible solutions, search for relevant information to answer their questions, monitor their own comprehension, and answer the questions that they have. Furthermore, the students develop ownership of their learning during the activity. And lastly, during the Summarizing stage, the students will identify and integrate important information presented in the text.

After the two-week experimental procedure, each group was given a posttest examination using the same 30 item test questionnaire which was used in the pretest. The results of the pretest and posttest examinations of each group were analyzed using independent-sample and paired-sample t-test to draw a sound and valid conclusion on the effect of reciprocal teaching strategy to students' academic performance in the subject "The Contemporary World".

2.4 Research Instrument

Since the intention of this study is to describe the existing situation without any attempt to influence it, this study used a researcher-made survey checklist to determine whether the students manifest symptoms of cabin fever, their coping mechanism to overcome cabin fever, and whether their responses are affected by their gender.

To determine the instrument's validity, three experts from the field of education and psychology were asked to validate the form and content of the survey checklist. Their comments and suggestions were reflected in the final form of the instrument. In addition, to test the instrument's reliability, a total of fifteen students who are not part of this study were asked to answer the online survey checklist and the results were subjected for a Cronbach's alpha test. The results show that the instrument is reliable having a Chronbach's alpha value of 0.78.

After having found that that instrument is valid and reliable, the researcher-made survey checklist was converted into an electronic survey questionnaire using Google Forms Application and the link was posted to different social media platforms to reach wider participants. The online survey last for about five days during the first week of August, 2020.

The online survey checklist is divided into three parts: Part 1 – Informed Consent Form, Part 2 – Respondent's Profile, and Part 3 – Checklist of Cabin Fever Symptoms and Effects. Part 3

of the online survey checklist consist of five questions that gathered the self-assessment of the respondent towards the symptoms of cabin fever, which includes where do they stayed during the community quarantine, who are their companion/s during the community quarantine, what do they feel during the implementation of the community quarantine, what sudden change in their behavior and routine that they have noticed, and how do they spend their days during the implementation of the community quarantine. Questions number three and four consists of five choices which represents the degree of agreement of each respondent had on the given statement.

Statistical measures are used in making inferences, interpretations, conclusions, or generalizations of this study. After the retrieval of the online survey checklist, responses of the students were tallied, tabulated, analyzed, and interpreted by the researchers using statistical tools such as percentage, mean, and Chi-square test.

III. RESULTS AND DISCUSSION

Data were analyzed by using IBM SPSS STATISTICS version 22. Before analyzing the data, all assumptions of the analysis were checked.

3.1 Mean Score of the Pretest and Posttest Examination

As part of the experimental procedure, the researcher gave a 30-item pretest examination to control and experimental groups to determine the level of their prior knowledge about the topics that will be discussed within the two-week experimental procedure. After which, the same test was given that served as a posttest to determine whether the use of reciprocal teaching strategy influence the academic performance of the students under the experimental group. For comparison, posttest was also given to those students who does not received reciprocal teaching strategy.

The mean score of the Pretest and Posttest of the two groups of students is shown in Table 1. As glean from the table, the mean score of the control ($X=15.07$) and experimental group ($X=15.09$) shows no significant difference. Their mean scores are almost the same, implying that students in both groups have the same level of prior knowledge during the conduct of this study.

After the two-week experimental procedure, a change in the students' academic performances is observe. Both control and experimental groups showed an increase in their mean score after the procedure. Mean score of the posttest of the control group ($X=18.62$) and experimental group ($X=23.09$) shows a significant increase, as compared to the mean score of their pretest examination results. This denotes that, students under the control group, despite of not receiving reciprocal teaching strategy shows an improvement, and same as those students who received reciprocal teaching strategy.

Table 1. Mean Score of the Pretest and Posttest Examination of the Control and Experimental Groups

Group	Count	Mean (X)		Variance	
		Pretest	Posttest	Pretest	Posttest
Control	45	15.07	18.62	8.109	11.695
Experimental	45	15.09	23.09	6.356	13.083

3.2 Comparison between Pretest Examination Results using Independent sample t-test

To further support the claim of the above-mentioned results, Table 2 shows the result of the independent-sample t-test of the pretest examination of the control and experimental groups independent sample t –test is used to investigate whether a significant difference between the results of the pretest exists in both groups. The results shows that the computed t -value is 0.039 with 88 degrees of freedom (df). This value is not significant at 0.05 level of confidence since the computed t -value is less than the critical value which is 1.988. This denotes that the level of understanding and prior knowledge of the students in both groups are the same. Thus, any change in their achievement after the experimental process is directly affected by the intervention used.

Table 2. Result of the Independent-sample t-test of the Pretest Examination of the Control and Experimental Groups

Test	t-stat	df	p-value	t-crit	Upper	Lower	Significant*
Two Tail	0.039	88	0.969	1.988	-1.149	-1.105	no

*Alpha = 0.05

3.3 Comparison between Pretest and Posttest Examination Results using Paired sample t-test

Table 3 shows the result of the Paired-sample t-test of the Pretest and Posttest Examinations of the Control Group. As glean from the table, there is a significant change in the academic performance of the students before and after the experimental procedure. Despite the fact that the group does not received any intervention, the usual lecture discussion method brought a significant change in their performance before and after the conduct of this study. Table 3 shows that the computed t-value is -5.202 with 44 degrees of freedom (df). This value is significant at 0.05 level of confidence since the absolute computed t -value is greater than the critical value which is 2.015.

Table 3. Result of the Paired-sample t-test of the Pretest and Posttest Examinations of the Control Group

Test	t-stat	df	p-value	t-crit	Upper	Lower	Significant*
Two Tail	-5.202	44	0.000	2.015	-4.933	-2.178	yes

*Alpha = 0.05

Furthermore, the results of the pretest and posttest examination of the experimental group was compared using the paired-sample t-test, as shown in Table 4. As expected, there is a significant change in the academic performance of the students, since they are subjected to an intervention which is the reciprocal teaching strategy. The result shows that the computed t-value is -11.736 with 44 degrees of freedom (df). This value is significant at 0.05 level of confidence since the absolute computed t -value is greater than the critical value which is 2.015. This results denotes that after the two-week experimental procedure with the use of reciprocal teaching strategy, students under the experimental group shows a significant change on their academic performances.

Table 4. Result of the Paired-sample t-test of the Pretest and Posttest Examinations of the Experimental Group

Test	t-stat	df	p-value	t-crit	Upper	Lower	Significant*
Two Tail	-11.736	44	0.000	2.015	-9.373	-6.626	yes

*Alpha = 0.05

3.4 Comparison between Pretest Examination Results using Independent sample t-test

To support the claim of this study, Table 5 shows the result of the independent-sample t-test of the posttest examination of the control and experimental groups. The independent sample t –test was also used to determine whether there is a significant difference between the results of the posttest examination results of the control and experimental groups, and identify whether the utilization of the reciprocal teaching strategy brought a significant change in the students’ academic performances. The results revealed that the computed t -value is 6.019 with 88 degrees of freedom (df). This value is significant at 0.05 level of confidence since the computed t -value is greater than the critical value which is 1.99. This denotes that students under the experimental group and exposed to reciprocal teaching strategy performed better than that of the students under the control group. Thus, rejecting the hypothesis of this study which is previously mentioned that there is no significant difference in the academic performances between the two groups. This study claims that after the implementation of the reciprocal teaching strategy, a significant change in the academic performance of the students in the subject “The Contemporary World” is seen and observed.

Table 5. Result of the Independent-sample t-test of the Posttest Examination of the Control and Experimental Groups

Test	t-stat	df	p-value	t-crit	Upper	Lower	Significant*
Two Tail	6.019	88	0.000	1.99	-5.941	-2.992	yes

*Alpha = 0.05

Furthermore, the above result supported the claims of the study conducted by Mohammad Salehi, and Sepideh Vafakhah (2013), Rodilil and Prastyo (2017), Choo et al., (2011), and Reilly et al.

(2013) concerning the positive effects of reciprocal teaching strategy on the academic performances of the students. In addition, the researcher found out that after the two-week study, students in the experimental group gain an improved understanding of complex text in the subject ‘The Contemporary World’ which leads to developing an increase conceptual knowledge of the topic, improved students’ reading and comprehension skills, develop a more positive attitudes towards extracting, organizing, and recording information within the subject, confidence to read, developed leadership skills, and develop collaborative skills among the learners. This study shown that when reciprocal teaching is used, the students develop a substantial gains in understanding the concepts being discussed in the class.

IV. CONCLUSION AND RECOMMENDATIONS

After the two-week experimental procedure, a significant change in the academic performances of the students in both control and experimental groups. Pretest support the claim that students in both groups have the same level of prior knowledge as revealed by their mean score, however after the experimental procedure, students show an improvement on their posttest score. The result of the independent sample t-test revealed that students in the experimental group performed better as compared to those students under the control group. This study concludes that the use of reciprocal teaching strategy in teaching the subject ‘The Contemporary World’ greatly affects the academic performances of the students. Also, structured reading and comprehension strategy allows the students to develop reading and comprehension skills, positive attitudes towards extracting, organizing, and recording information within the subject, confidence to read, leadership skills, and collaborative skills. The use of reciprocal teaching is highly encourage in the tertiary level, most especially in the subjects across the General Education Curriculum, since subjects under the New General Education Curriculum requires an in-depth comprehension skills among college students.

ACKNOWLEDGMENT

The researchers would like to thank all the students of Quezon City University who participated in this study, and to the QCU administration, faculty and staff. The researchers would also like to acknowledge the support and patience of her family during the conduct of this study.

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Gender Difference in Self-reported Symptoms of Cabin Fever among Quezon City University Students during the Covid19 Pandemic

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DOI: 10.29322/IJSRP.10.09.2020.p105102

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p105102>

Abstract- The Covid-19 pandemic has changed our way of life and the education sector is one of the most affected by this global crisis. This study primarily aims to determine the effects of the implementation of the Community Quarantine in Metro Manila to the students of Quezon City University, particularly the manifestation of cabin fever. A total of 252 students participated in this study via online survey. The results show that majority of the respondents experience a none to mild symptoms of cabin fever. No gender difference seen on the effects of cabin fever among students, however most of the female respondents agreed that they experience having a difficulty in concentrating and sudden food cravings. The study concludes that cabin fever is one of the many effects of community quarantine and should not be neglected. Parents and educational leaders are encourage to optimize home as a multipurpose learning environment.

Index Terms- Cabin fever, Covid-19 pandemic, Self-reported Symptoms, Gender difference, Tertiary education

I. INTRODUCTION

The Covid-19 pandemic has changed our everyday way of lives. As countries implemented preventive measures to control the transmission of covid-19 virus, world leaders have decided to impose different forms of lockdowns. Its citizens are advised to stay at home and be physically distant to one another. This brought a great impact on the different facets of the society. Schools in particular, are greatly affected on this. During community quarantine schools were closed, students leave no choice but to stay at home and were introduced in various forms of flexible learning modalities.

In the Philippines, the government implemented the Enhance Community Quarantine (ECQ) few months after the onset of the Covid-19 and a week after the World Health Organization declared that Covid-19 is characterized as pandemic (World Health Organization, 2020). Community Quarantine is a term used in the Philippines that is synonymous to lockdown, because instead of using the former, which can cause panic to people, the government adopted the terms

Community Quarantine. The Philippine government adopted the term “Community Quarantine” instead of nationwide lockdown to avoid the panic that it might cause to people. Community quarantine is classified as Enhanced Community Quarantine (ECQ), Modified Enhanced Community Quarantine (MECQ), General Community Quarantine (GCQ) and Modified General Community Quarantine (MGCQ), variations of these categories lie on the limitations of movement of people, and economic or business transactions and operations, from strict ECQ to less strict MGCQ. Among the four categories, Metro Manila experienced ECQ, MECQ, and GCQ where movement of people are completely limited, especially to those ages under 20 years old and below and senior citizens. Students from college down to the primary grade were subjected to this, they are not allowed to go out unless they have a very important or essential matters to do outside their home.

The Office of the President initially ordered the government office heads, local government units (LGU’s) and state universities and colleges to place the entire Luzon to Enhanced Community Quarantine (ECQ). A strict home quarantine shall be observed, movement shall be limited, work from home arrangement shall be implemented and classes and school activities in all levels shall be suspended from March 17, 2020 to April 13, 2020. The ECQ classification in Luzon was extended until May 15, 2020 and later changed into MECQ and GCQ (www.officialgazette.gov.ph). Quezon City is one of the hard hit area in Metro Manila of the Covid-19 pandemic, as of writing this paper, about 6,880 confirmed cases were recorded. As Quezon City covid-19 cases surge to 9,540 as of August 21, the city landed on one of the hard hit area in Metro Manila, according to Chavez (2020)

Quezon City University and its students is not exempted to this, and due to limited facilities that will take care of the covid19 patients, the university is also converted into a Quarantine Facility making face-to-face classes more obscure and not possible. In response to the memorandum ordered by the President, Quezon City University immediately advised its Faculty to postpone face-to-face classes and implement work arrangements. The President of the Philippines is firm to his

decision of “no vaccine, no face-to-face classes”. Students are isolated at their respective homes and make the most of their time indoors.

According to psychologists, medical practitioners, and other mental health professionals, isolation brought by various natural phenomena such as the pandemic may cause to a so-called cabin fever, because socialization and movement are being restricted. Originally, cabin fever is described as the irritable feelings of people who lived way out in the country and stuck in their “cabins” due to changes of season or weather. Hartwell-Walker (2020) states that because of lack of social interaction and isolation, people got restless, irritable and lonely. In addition, Fritscher (2020), stresses that cabin fever is a common response when a person experienced confinement over a long period of time. Furthermore, it describes the psychological symptoms that people may experience when they are unable to leave their home and engage in social interaction. It is not a specific diagnosis, but rather a constellation of symptoms that can occur when someone is being socially isolated, and it is not listed on DSM-5, the manual of mental illness but its acknowledge to be real and can significantly affect a person’s quality of life. He opines further that cabin fever will experience exactly the same symptoms, but many people report feeling intensely irritable or restless. Other commonly experienced effects such as irritable or being restless, lethargy, sadness or depression, trouble concentrating, lack of patience, food cravings, decreased motivation, difficulty in waking up, frequent napping, and hopelessness. It is important to note that these symptoms may also be indicative of a wide range of other disorders. If these symptoms are distressing or impacting the person’s regular functioning, a trained mental health professional could help you determine if you have a treatable disorder. The behavioral effects of cabin fever may include: (1) feeling unable to keep up with a daily or weekly routine; (2) difficulty sleeping; (3) sleeping too much; (4) difficulty concentrating; (5) changes in grooming; (6) changes in eating habits; and (7) drinking too much alcohol.

According to Young (2020), human beings evolved as social animals, and, on the whole, people tend to feel good and function better effectively when they connect with one another. In addition, Rogers (2020) states that human beings are social creatures, but some are more social than others. Also, people who are highly social or active may be more prone to cabin fever than those who are accustomed to spending time alone. The shift from a socially active way of life to a more limited and isolated one can be enough to trigger cabin fever. Furthermore, Porpa (2020) stresses that people around the world may experience cabin fever during lockdowns and physical isolation due to Covid-19 pandemic and it is more common and widespread as compared in the past decade.

Some factors that can cause or contribute to cabin fever includes feeling unable to connect physically with friends and family, being unable to partake in activities that the person finds enjoyable or meaningful, becoming burned out by work, feeling unmotivated and lethargic due to having too little or no work, and becoming increasingly anxious about finances due to a lack of income, according to Fritscher (2020); Park (2020); Rogers (2020) and Young (2020).

Sng (2020) emphasizes that different people may experience a combination of symptoms, and to a varying extent.

This depends on their personality, temperament and current coping abilities. For instance, extroverts may feel worse at first because they enjoy being with other people. Jones (2020) and Sng (2020) point out that while extroverts can adapt to being alone with time, as isolation prolongs, both extroverts and introverts may similarly find themselves feeling distressed at the situation.

Of greater concern are those who already have mental health issues. These people should seek the help they need if they feel their moods deteriorating, according to Dresden, (2020) and Lange (2020). Similarly, Dresden (2020) and Sng (2020) state that the increased distress experienced may trigger other mental health disorders like generalized anxiety, paranoia, obsessive compulsive disorder, depression and some may entertain suicidal thoughts.

In the midst of the Covid-19 pandemic, students from Local Colleges and Universities (LCUs) especially in Quezon City University (QCU) faced a hard time to adjust to the so-called “New Normal”. Identifying the experiences of students during the lockdown and whether they experienced a cabin fever is very essential at this point, so that educational leaders and even parents may develop coping strategies and activities for them. Thus, this study primarily aims to explore the effects of the implementation of the Community Quarantine in Metro Manila among the students of Quezon City University.

Specifically, this study aims to determine if the students of Quezon City University manifest symptoms of cabin fever as a result of the implementation of the Community Quarantine in Metro Manila; determine the effects of the implementation of the Community Quarantine in Metro Manila among college students in terms of physical, mental, and psychological that leads to the manifestation of cabin fever symptoms; identify the coping mechanisms used by the students to overcome the negative effects of the implementation of the Community Quarantine in Metro Manila; determine the significant difference in self-reported symptoms of cabin fever among students of Quezon City University during the implementation of the Community Quarantine in Metro Manila in terms of their gender; and based from the results, identify some interventions that may be used by educational leaders and parents to help the students to overcome the effect of cabin fever during the pandemic.

This study hypothesize that students of Quezon City University does not experience or even manifest symptoms and effects of cabin fever during the implementation of the Community Quarantine in Metro Manila, and there is no significant difference in self-reported symptoms and effects of cabin fever among students of Quezon City University during the implementation of the Community Quarantine in Metro Manila in terms of their gender.

II. METHODOLOGY

2.1 Research Design

Descriptive research design was employed in this study. Descriptive research is a type of research that is mainly concerned with describing the nature or condition and the degree in the detail of the present situation. This method is used to describe the nature of a situation, as it existed at the time of the study and to explore the cause of a particular phenomenon

according to Fraenkel, Wallen, and Hyun (2013). The aim of descriptive research is to obtain an accurate profile of the people, events or situations. With this research type, it is essential that the researcher already has a clear view or picture of the phenomena being investigated before the data collection procedure is carried out. The researcher used this kind of research to obtain first hand data from the respondents so as to formulate rational and sound conclusions and recommendations of the study. The descriptive approach is quick and practical in terms of the financial aspect. In addition, descriptive method is advantageous due to its flexibility, which can use either qualitative or quantitative data or both, giving the researcher greater options in selecting the instrument for data-gathering.

2.2 Locale and Time of the Study

The study was conducted in Quezon City during the onset of the Covid19 pandemic and the implementation of the Community Quarantine in Metro Manila, Philippines.



Figure 1. The Locale of the Study

2.3 Population and Sampling

The general population of this study refers to all college students of QCU who are officially enrolled during the Second Semester of the Academic Year 2019-2020. From a total of seven thousand one hundred seventy (7,170) students, a total of two hundred fifty two (252) students participated and served as

the respondents of this study. The total sample size was obtained using the formula of Laurentina Paler-Calmorin and Melchor Calmorin (2012). To obtain the sample respondents, the study employed the convenience non-random sampling techniques, where in the sample is any group of individuals that is conveniently available to be studied. In this case, since the city is under community quarantine, answering the survey checklist in a face-to-face manner is impossible, that is why whoever is available to answer the online survey checklist during the survey period until the total number of respondents is achieved were considered to be the respondents of the study. Furthermore, before the respondent to be included in the study, he or she must be a bonafide student of QCU during the Second Semester of the Academic Year 2019-2020, and to ensure the quality of data, those completely filled out online survey checklists were considered for data analysis and interpretation.

2.4 Research Instrument

Since the intention of this study is to describe the existing situation without any attempt to influence it, this study used a researcher-made survey checklist to determine whether the students manifest symptoms of cabin fever, their coping mechanism to overcome cabin fever, and whether their responses are affected by their gender.

To determine the instrument's validity, three experts from the field of education and psychology were asked to validate the form and content of the survey checklist. Their comments and suggestions were reflected in the final form of the instrument. In addition, to test the instrument's reliability, a total of fifteen students who are not part of this study were asked to answer the online survey checklist and the results were subjected for a Cronbach's alpha test. The results show that the instrument is reliable having a Chronbach's alpha value of 0.78.

After having found that that instrument is valid and reliable, the researcher-made survey checklist was converted into an electronic survey questionnaire using Google Forms Application and the link was posted to different social media platforms to reach wider participants. The online survey last for about five days during the first week of August, 2020.

The online survey checklist is divided into three parts: Part 1 – Informed Consent Form, Part 2 – Respondent's Profile, and Part 3 – Checklist of Cabin Fever Symptoms and Effects. Part 3 of the online survey checklist consist of five questions that gathered the self-assessment of the respondent towards the symptoms of cabin fever, which includes where do they stayed during the community quarantine, who are their companion/s during the community quarantine, what do they feel during the implementation of the community quarantine, what sudden change in their behavior and routine that they have noticed, and how do they spend their days during the implementation of the community quarantine. Questions number three and four consists of five choices which represents the degree of agreement of each respondent had on the given statement.

Statistical measures are used in making inferences, interpretations, conclusions, or generalizations of this study. After the retrieval of the online survey checklist, responses of the students were tallied, tabulated, analyzed, and interpreted by the

researchers using statistical tools such as percentage, mean, and Chi-square test.

III. RESULTS AND DISCUSSION

3.1 Respondents' Profile

The study primarily aims to explore the effects of the implementation of the Community Quarantine in Metro Manila among the students of Quezon City University, thus identifying factors such as gender, course studied, year level, location and place where the respondents stayed and their companion during the implementation of the community quarantine are deemed necessary. The following results present the profile of the respondents of this study.

Table 1. Course Studied

Course/Program	Frequency (f)	Percentage (%)
Accountancy	55	21.83
Engineering (Industrial and Electronics)	9	3.57
Entrepreneurship	124	49.21
Information Technology	64	25.40
Total	252	100.0

A total of two hundred fifty two (252) respondents participated in this study. Table 1 shows that in terms of course program, majority of the participants are taking up Bachelor of Science in Entrepreneurship with a total of one hundred twenty four (124) students or equivalent to 49.21% of the total respondents. It was followed by respondents under Bachelor of Science in Information Technology with a total of sixty four (64) students (25.40%) and Bachelor of Science in Accountancy with a total of fifty five (55) students (21.83%). And there are only nine (9) students (3.57%) from the engineering department who participated in this study.

Table 2. Year Level

Year Level	Frequency (f)	Percentage (%)
First Year	62	24.60
Second Year	104	41.27
Third Year	76	30.16
Fourth Year	10	3.97
Total	252	100.0

In terms of year level, Table 2 shows that the majority of the respondents are on their second year in the university (41.27%) which is almost half of the respondents, while 30.16% of the respondents are on their third year and about 24.60% of the respondents are on their first year, while 3.97% are on their fourth year.

Table 3. Gender

Gender	Frequency (f)	Percentage (%)
Male	73	28.97
Female	179	71.03
Total	252	100.0

Furthermore, since this study focused on the response of male and female students towards the manifestation of cabin fever symptoms, majority of the respondents who participated in this study are female with a total of one hundred seventy nine (179) or 71.03%, while the remaining 28.97% or equivalent to seventy three (73) respondents are males. The result was supported by the study of Kasahara, et al. (2019) that males are more likely to report never post on social media and females are more likely to report posting very often.

However, this data contradicts the current statistical report that males are more active online as compared to females (Kemp, 2020). This data also contradicts the report that females are less likely to be active on social media as compared to males (Kemp, 2020). Furthermore, males are found to be more addicted to social media than females (Alnjadat, et al, 2019).

Table 4. Congressional District

Congressional District	Frequency (f)	Percentage (%)
District I	15	5.95
District II	118	46.83
District III	16	6.35
District IV	10	3.97
District V	59	23.41
District VI	34	13.49
Total	252	100.0

According to the local news, Quezon City is the hardest hit area in the National Capital Region during the on-set of the Covid-19 pandemic (Ramos, 2020). In a report, a total of 1,464 virus cases were recorded in Quezon City during the conduct of this study (Ramos, 2020). Barangay Culiati, Batasan Hills, Pasong Tamo, Bahay Toro, and New Era were the most number of active cases in the city, and they are located in Districts 1, 2, and 6.

In terms of the location where the respondents live within the city, Table 4 reveals that almost half of the respondents resides in District 2 with a total of one hundred eighteen (118) or 46.83%, followed by respondents from the District 5 and 6 with a total of fifty nine (59) and thirty four (34) respondents respectively. The remaining portion of the respondents comes from District 3, 1, and 4 with a total of sixteen (16), fifteen (15), and ten (10) respondents respectively.

Table 5. Place stayed during the implementation of the Community Quarantine in Metro Manila

Place Stayed	Frequency (f)	Percentage (%)
Home	240	95.24
Apartment/Boarding House	6	2.38
Workplace	2	0.79
Others	4	1.59
Total	252	100.0

Since cabin fever is a usual response of a person who experience isolation or confinement over a long period of time (Fritscher, 2020), determining where the respondents stayed as well as their companion during the implementation of the

community quarantine is necessary to clearly describe the situation of the respondents and whether they truly manifest cabin fever symptoms during the pandemic. Table 5 shows that during the implementation of the community quarantine in Metro Manila, majority of the respondents stayed at home with a total of two hundred forty (240) respondents or equivalent to 95.24%. While the remaining four percent of the respondents either stayed on their apartment or boarding house, workplace, or working area.

Table 6. Companion during the implementation of Community Quarantine

Companion	Frequency (f)	Percentage (%)
Family	240	95.24
Friends/Classmates	3	1.19
Workmates	5	1.98
Alone	1	0.40
Others	3	1.19
Total	252	100.0

And since majority of the respondents stayed at home during the implementation of the community quarantine, it is expected that they are with their family. Table 6 shows that a total of two hundred forty (240) or equivalent to 95.24% of the respondents stayed together with their family during the community quarantine. The remaining four percent stayed together either with their friends or classmates, workmate, or spending most of their time alone.

3.2 Manifestation of cabin fever symptoms as a result of the implementation of the Community Quarantine in Metro Manila among Quezon City University students

As previously mentioned, cabin fever is a term used to describe a common response of a person who experience isolation or confinement over a long period of time (Fritscher, 2020). And it also describes the psychological symptoms that people may experience when they are unable to leave their home and engage in social interaction. Furthermore, it is not a specific diagnosis, but rather a constellation of symptoms that can occur under these circumstances. According to literature, if someone is experiencing cabin fever as a result of social distancing or self-quarantine in the wake of the coronavirus (COVID-19) pandemic, he or she may have a feeling of additional stress beyond that which stems from simply being isolated (Fritscher, 2020).

The survey conducted in this study reveals that the over-all manifestation of cabin fever among students of Quezon City University (QCU) is classified as mild, with an over-all weighted mean of 1.99, which is shown in Table 7.

Table 7. Manifestation of Cabin Fever due to the implementation of Community Quarantine

Symptoms	Weighted Mean	Verbal Interpretation	Rank
Intensely Irritable	1.74	None	8
Restless / Lethargic	1.71	None	9
Sad	2.47	Mild	1
Lazy / Demotivated	2.41	Mild	2
Fearful / Anxious	2.39	Mild	3
Hopeless	1.89	Mild	5
Helpless	1.76	Mild	7
Impatient	1.99	Mild	4
Withdrawn / Isolated	1.69	None	10
Paranoid	1.86	Mild	6
Over-all Weighted Mean	1.99	Mild	

Scale: 1-None; 2-Mild; 3-Moderate; 4-Severe; Range: None = 1.00-1.74; Mild = 1.75-2.49; Moderate = 2.50-3.24; Severe = 3.25-4.00

As gleaned from the table, symptoms such as sadness, laziness or being demotivated, and fearfulness or anxiousness are among the top three symptoms that has been observed to be prevalent among the respondents, with a computed weighted mean value of 2.47, 2.41, and 2.39 respectively. According to Baloran (2020), majority of the students displayed anxiety during lockdown. Their worries are food, financial resources and the possibility of being infected. Roy et al. (2020) revealed that individuals were worried for themselves and their families during the pandemic (as cited by Baloran, 2020). Furthermore, Lee (2020) concluded that covid-19 pandemic affects students' mental health (as cited by Baloran, 2020).

In addition, symptoms such as being impatient, hopelessness, paranoia, and helplessness are seen to be mild among the respondents with computed weighted mean values of 1.99, 1.89, 1.86, and 1.76 respectively. And lastly, majority of the student respondents reported that they have no symptoms of being intensely irritable, restlessness or being lethargic, and feeling withdrawn or isolated during the implementation of the community quarantine with computed weighted mean values of 1.74, 1.71, and 1.69 respectively. According to Fritscher (2020) not everyone manifest exactly the same symptoms, but most of the people who experience cabin fever report a feeling of intense irritability or restlessness (Fritscher, 2020).

The above results show that despite of almost six months of the implementation of the community quarantine, majority of the respondents show only mild symptoms of cabin fever. However, upon analysing the data, it revealed that these mild manifestation will eventually reach the moderate level if the implementation of the community quarantine becomes more longer in terms of time and restrictions. However, possibly that student respondents will be used to stay at home and live their lives even there is an existing lockdowns. It is possible that students are used to staying at home since they only have a school-bahay routine and minimal participation in social gatherings and larger network just like the adults. This observation might be associated with the results of their response when it comes on how they overcome the negative effects of the implementation of the community quarantine as shown in Table 9.

In addition, a previous study on the attitude of students toward schooling during covid-19 revealed that students agree on the stoppage of schools and approved the extension of the opening of classes for the next semester due to the pandemic (Baloran, 2020).

It is also important to consider that the above reported symptoms may also be an indicative of a wide range of other disorders. Fritscher (2020) noted that, if these symptoms become a distressing or impacting the person's regular way of living, it is necessary to seek the help of a well-trained mental health professional to treat the disorder.

3.3 Associated Effects of cabin fever and the Implementation of the Community Quarantine in Metro Manila

Even though cabin fever is not a recognized psychological illness, its emotional, physical, and behavioural effects are real, and they can significantly affect a person's quality of life. Literature revealed that feeling unable to keep up with a daily or weekly routine, having difficulty in sleeping, over sleeping, having difficulty in concentrating, sudden change in grooming and in eating habits, and drinking too much alcohol are some of the adverse effect of cabin fever. Table 8 shows the response of the students towards the effects of the implementation of the community quarantine to them.

The researchers classified the effects of the implementation of the community quarantine in Metro Manila among college students into physical, mental, and psychological factors, for the purpose of identifying the extent of the effects of community quarantine and its association to the manifestation of cabin fever symptoms.

Table 8. Effects of the implementation of the Community Quarantine

Effects	Weighted Mean	Verbal Interpretation
<i>Physical</i>		
Sudden change in grooming	2.08	Disagree
Loss / gain of weight	2.53	Agree
<i>Mental</i>		
Trouble / Difficulty Concentrating	2.15	Disagree
<i>Psychological</i>		
Food cravings	2.64	Agree
Changes in eating habits	2.56	Agree
Difficulty waking	2.17	Disagree
Difficulty sleeping	2.52	Agree
Frequent napping / sleeping too much	2.11	Disagree
Struggled to start on doing things	2.26	Disagree
Engage in snapping at people / short temperament	1.94	Disagree

Scale: 1 – No Comment; 2 – Disagree; 3 – Agree; Range: No Comment = 1.00-1.66; Disagree = 1.67-2.33; Agree = 2.34-3.00

As gleaned from Table 8, in terms of physical factors, majority of the respondents agreed that they either loose or gain weight during the lockdown period, with a computed weighted mean of 2.53. On the study of Zacahary, et al. (2020) lack of sleep, decreased physical activity, snacking after dinner, eating in

response to stress and eating because of the appearance or smell of the food are behaviours linked to weight gain during self-quarantine. Furthermore, Sharma (2020) state that community-wide quarantine in the pandemic has forced people to stay indoors which has the potential to cause weight gain, similar to holiday weight gain, due to availability of the food, staying at home, emotional distress, lack of physical activity, increased control levels and altered sleep. It was also found out that the change in diet and physical activity increases the risk of cardiovascular disease (Mattioli, 2020).

On the other hand, in terms of sudden change of grooming, most of the respondents disagreed that the Metro Manila lockdown does not affect their grooming habit, with computed weighted mean of 2.08. However, this computed weighted mean is somehow getting close to the fact that grooming is also affected by the lockdown.

In terms of mental factor, respondents disagree that they have experienced trouble or difficulty in concentrating due to the implementation of the community quarantine. This result shows that respondents still have their focus on things that they do in their respective home during the lockdown. This result may also be associated on how the respondents used their time to cope-up with the negative effects of the implementation of the community quarantine as shown in Table 9.

Furthermore, in terms of psychological effects of the implementation of the community quarantine, three out of the seven identified possible implications of cabin fever and effects of community quarantine, show that majority of the students agreed that they experienced them during the lockdown, such as food cravings, changes in eating habits, and difficulty in sleeping, with computed mean values of 2.64, 2.56, and 2.52 respectively. This results might also be associated on the way how the students overcome the effects of community quarantine. Sharma (2020) reported that community-wide quarantine has forced people to stay indoors which has the potential to cause weight gain due to availability of the food, staying at home, emotional distress. In addition, Zacahary, et al. (2020) stated that during self-quarantine, individuals usually have problem on sleeping, and found out to snacking frequently in response to stress.

Brooks et al. (2020) mentioned that among the psychological impact of quarantine are post-traumatic stress symptoms, confusion and anger. The stressors included are longer quarantine duration, infection fears, frustration, boredom, inadequate supplies, inadequate information, financial loss and stigma. During the period of quarantine, negative psychological effect is unsurprising, yet the evidence that a psychological effect of quarantine can still be detected months or years later, as concluded from small number of studies.

According to literature, majority of the people around the world are currently experiencing cabin fever while physically isolating in response to the Covid19 pandemic (Porpora, 2020). Furthermore, cabin fever may be more common and widespread as compared before due to the implementation of lockdown or community quarantine in key areas or places across the world due to the pandemic.

The reported effects of community quarantine in Quezon City among the students can trigger cabin fever according to Rogers (2020), due to the shift from socially active

to a more restricted, limited, and isolated way of life. In addition, the above-mentioned physical, mental, and psychological factors can cause or contribute to cabin fever according to Fritscher (2020), Park (2020), and Young (2020).

3.4 Coping mechanisms of students to overcome the associated effects of cabin fever and the implementation of community quarantine in Metro Manila

Despite the context of isolation brought by the pandemic, some reports revealed that fraction of the students, most especially those who are considered as introverts, find that lockdowns or community quarantines offers a unique kind of relief (Campa, 2020). However, this study does not cover those extrinsic and intrinsic characteristics of students. This only shows that, various individuals find different ways to overcome the negative effects of certain phenomenon, such as the current pandemic. Table 9 shows the response of the students towards the coping mechanisms that they used to overcome the associated effects of cabin fever and the implementation of the Community Quarantine in Metro Manila.

Table 9. Coping mechanisms of the students to overcome the associated effects of cabin fever and the implementation of the Community Quarantine in Metro Manila

Coping Mechanisms	Frequency* (f)	Percentage (%)	Rank
Online (Social Media, Watching videos/movies, Gaming, Online Shopping/Selling, etc.).	238	94.44	1
Family bonding (Watching TV, Karaoke/ Videoke, etc.).	129	51.19	2
Household chores (Cleaning the house, Washing the dishes, Doing the Laundry, etc.)	5	1.98	5
Learning a new hobby (baking, painting/decorating, gardening, etc.)	114	45.24	3
Others	37	14.68	4

*Respondents may answer multiple response

As shown in the table, almost 95% or majority of the respondents said that they spend their time online during the implementation of the lockdown, either on social media, watching videos or movies, online gaming, and online shopping or selling. The above results show that online activities can probably lessen the symptoms of cabin fever and its associated effects.

According to the recent data on the use of internet, people all over the world who are using the internet increased by 7% as compared to last year, with a total of 4.54 billion users (Kemp, 2020). Furthermore, one third of the time in using the internet spent in using social media (Kemp, 2020), and in the Philippines, most of the Filipino spend about 9 hours and 45 minutes per day online, and considered as one of the top online users among other countries in the world (Kemp, 2020). Moreover, the above result is not surprising, because students who participated in this study are all considered digital natives or belongs to the generation who grew up in the age of modern-day technology, and the age of computers and internet (Halton, 2019).

According to Pew Research Center (2015), online activities provides a positive influence on education, personal relationship, and economy in developing nations like the Philippines, however, it has a negative influence morality and politics (Pew Research Center, 2015). Thus the above result might be associated why cabin fever symptoms are mild in general among the students of Quezon City University and show less negative effects among them.

However, spending more time online might also lead to other disorders or problems. Various studies have found that there is a significant relationship between the increasing time of using internet, most specifically, social media to poorer mental health, including depression, anxiety, feeling of loneliness or isolation, lower self-esteem, and even suicidal.

Aside from online activities, Table 9 shows that respondents also used their spare time during the lockdown to bond with their family members. As previously mentioned, majority of the respondents stayed at home during the lockdown, thus it is expected that they spend more time together with their family members. Among with the activities that they do together with their family members are watching T.V and singing in Karaoke.

During the implementation of the community quarantine, learning new hobbies is a trend. Maybe due to the fact that people become bored and doing things monotonously, they tried to find new hobbies. Table 9 shows that aside from doing online activities, bonding with their families, respondents also started to learn new hobbies during the lockdown such as baking, painting, decorating, and gardening to name a few. This result might be associated on the mild manifestation of cabin fever symptoms, student respondents did not notice the negative effects of the lockdown because they are learning new hobbies.

Surprisingly, only few of the respondents do household chores such as cleaning the house, washing the dishes, or doing the laundry during the implementation of the community quarantine. As expected, since majority of them are staying at home, they find time to help their parents to do household chores, however, the results revealed that only 1.98% or five out of the two hundred fifty two respondents perform household chores during the lockdown to overcome the negative effects associated to cabin fever and community quarantine.

The study of Baloran (2020) revealed that the most common coping strategies of students during the pandemic include strict personal protective measures, avoiding going out in public places to minimize exposure from the virus and reading information about prevention and mechanism of transmission. In addition, some students use social media and social networks such as Facebook, Twitter, Tiktok, and You tube to name a few. However, only few of the students vent emotions by crying and screaming and get help from family physicians or other professionals to reduce stress and get assurance.

Brooks et al. (2020) highlighted that it is vital to ensure that effective mitigation measures are put in place as part of the quarantine planning process because negative psychological effects of quarantine might be evident months or years later.

3.5 Significant difference in self-reported symptoms of cabin fever among students of Quezon City University during the implementation of the Community Quarantine in Metro Manila in terms of their gender

One of the primary objectives of this study is to determine the difference on the self-reported symptoms and effects of cabin fever among students of Quezon City University during the implementation of the Community Quarantine in Metro Manila in terms of their gender. Despite the fact that majority of the respondents who participated in this study were female, the result of the survey also provides a significant information.

Table 10 shows the self-reported symptoms of cabin fever in terms of gender. As gleaned from the table both gender experience a none to mild symptoms of cabin fever such as intensely irritable restless or lethargic, sadness, laziness or being demotivated, fearful or anxious, hopeless, helpless, and impatient.

Table 10. Self-reported symptoms of cabin fever in terms of gender

Symptoms	Level	Gender		Total
		Male	Female	
Intensely Irritable	None	31 (42.47)	77 (43.02)	108
	Mild	32 (43.84)	76 (42.46)	108
	Moderate	7 (9.39)	22 (12.29)	29
	Severe	3 (4.11)	4 (2.23)	7
	Total	73	179	252
Restless / Lethargic	None	36 (49.32)	83 (46.37)	119
	Mild	24 (32.88)	67 (37.43)	91
	Moderate	12 (16.44)	25 (13.97)	37
	Severe	1 (1.37)	4 (2.23)	5
	Total	73	179	252
Sad	None	5 (6.85)	14 (7.82)	19
	Mild	42 (57.53)	80 (44.69)	122
	Moderate	19 (26.03)	65 (36.31)	84
	Severe	7 (9.59)	20 (11.17)	27
	Total	73	179	252
Lazy / Demotivated	None	9 (12.33)	22 (12.29)	31
	Mild	31 (42.47)	82 (45.81)	113
	Moderate	23 (31.31)	57 (31.84)	82
	Severe	10 (13.70)	18 (10.06)	26
	Total	73	179	252
Fearful / Anxious	None	11 (15.07)	25 (13.97)	36
	Mild	29 (39.73)	79 (44.13)	108
	Moderate	24 (32.88)	58 (32.40)	82
	Severe	9 (12.33)	17 (9.50)	26
	Total	73	179	252
Hopeless	None	31 (42.47)	70 (39.11)	101
	Mild	26 (35.62)	68 (37.97)	94
	Moderate	11 (15.07)	30 (16.76)	41
	Severe	5 (6.85)	11 (6.15)	16
	Total	73	179	252
Helpless	None	34 (46.58)	84 (46.93)	118
	Mild	25 (34.25)	66 (36.87)	91
	Moderate	10 (13.70)	19 (10.61)	29
	Severe	4 (5.48)	10 (5.59)	14
	Total	73	179	252
Impatient	None	21 (28.77)	59 (32.96)	80
	Mild	29 (39.73)	77 (43.02)	106
	Moderate	18 (24.66)	36 (20.11)	54
	Severe	5 (6.85)	7 (3.91)	12
	Total	73	179	252
Withdrawn / Isolated	None	41 (56.16)	93 (51.96)	134
	Mild	20 (27.40)	53 (29.61)	73
	Moderate	8 (10.96)	26 (14.53)	34
	Severe	4 (5.48)	7 (3.91)	11
	Total	73	179	252
Paranoid	None	36 (49.32)	76 (42.46)	112
	Mild	25 (34.25)	54 (30.17)	79
	Moderate	7 (9.59)	38 (21.23)	45
	Severe	5 (6.85)	11 (6.15)	16
	Total	73	179	252

Note: Numbers in parenthesis are row percentages

Table 10 reveals that both gender experience and manifest similar mild symptoms of cabin fever, and this result is supported by the Chi-square test results in Table 11.

A total of 108 male and female agreed that they do not feel intense irritability during the community quarantine, similarly 108 of the respondents felt a mild feeling of intense irritability. And 36 of the respondents felt mild to severe feeling of intense irritability during the implementation of the community quarantine. Based from Table 10, the manifestation of being an intense irritable person during the implementation of the community quarantine is almost similar in both gender, which is from none to mild symptoms.

Majority of the respondents self-assessed that they do not feel being restless or lethargic during the implementation of the community quarantine. A total of one hundred nineteen (119) out of the 252 respondents show no symptoms of being restless or lethargic during the implementation of the community quarantine. In terms of gender, the number of respondents who experience mild to severe restlessness or being lethargic shows no difference.

In terms of sadness due to the implementation of the community quarantine, it shows interesting result as noted in Table 10. Majority of the respondents agreed that they felt mild to severe sadness during the implementation of the community quarantine and during the time of pandemic. A total of one hundred twenty two respondents self-assessed that they felt mild sadness, and almost half of the male students (57.53 %) and female students (44.69%) agreed on this. Table 10 also reveals that most of the females felt moderate to severe sadness during the community quarantine and in the time of pandemic.

Majority of the respondents agreed that they felt mild to severe laziness and being demotivated during the implementation of the community quarantine. However, in terms of gender differences, Table 10 shows almost similar number of respondents felt mild to severe laziness and demotivation during the implementation of the community quarantine.

Percentages of male and female respondents who reported that they felt mild to severe fearfulness or anxiousness during the implementation of the community quarantine are almost the same as shown in Table 10. It further revealed that majority of the respondents said that they felt mild fear or anxiousness during the community quarantine and the pandemic.

Sixty percent of the respondents felt mild to severe hopelessness during the implementation of the community quarantine. In terms of gender, self-reported cabin fever symptoms such as hopelessness shows almost similar in terms of number of respondents who reported that they felt mild to severe hopelessness. On the other hand 40% of the respondents or a total of one hundred one respondents reported that they are not hopeless during the implementation of the community quarantine.

More than half of the respondents reported that they felt mild to severe feeling of helplessness, while 47% of them said that they do not feel being helpless during the implementation of the community quarantine. In terms of gender, Table 10 reveals that number or percentage of male and female students reported similar level of being helpless during the implementation of community quarantine.

Almost half of the respondents agreed that they felt mild symptoms of being impatient during the implementation of the community quarantine. A total of one hundred six out of the 252 respondents reported that they felt mild feeling of being impatient. Table 10 also shows that in terms of gender, almost same number of male and female students reported that they felt mild to severe feeling of being impatient during the implementation of the community quarantine and the pandemic.

Table 10 reveals that most of the respondents self-reported that they do not feel being withdrawn or isolated during the implementation of the community quarantine. Surprisingly, despite the result of showing mild to moderate feeling of being sad, lazy or demotivated, fearful or anxious, hopeless, helpless, impatient, and paranoid of the students as revealed by the survey, majority of them do not feel being isolated or withdrawn during the implementation of the community quarantine. This might be associated to the fact that majority of the respondents stayed at home together with their family and do various online activities as their mechanism to combat the negative effect of the implementation of community quarantine or even the pandemic.

Lastly, more than half of the respondents self-reported that they felt mild to severe paranoia during the implementation of the community quarantine. In terms of gender, the number of male and female respondents who self-reported that they felt mild to severe paranoia during the implementation of the community quarantine is almost the same. This is also the same with those who said that they do not feel any paranoia during the implementation of the community quarantine.

Table 11. Chi-square Test Results of the Self-reported symptoms of cabin fever in terms of gender.

Symptoms	χ^2	df	Asymp. Sig. (2-sided)
Intensely Irritable	1.012	3	0.798
Restless / Lethargic	0.804	3	0.848
Sad	3.598	3	0.308
Lazy / Demotivated	0.751	3	0.861
Fearful / Anxious	0.686	3	0.877
Hopeless	0.356	3	0.949
Helpless	0.530	3	0.912
Impatient	1.861	3	0.602
Withdrawn / Isolated	1.041	3	0.791
Paranoid	4.799	3	0.187

*Significant at 0.05 level

Table 11 reveals that the Chi-square values for the symptoms such as intensely irritable ($\chi^2=1.012$; $p=0.798$), restless or lethargic ($\chi^2=0.804$; $p=0.848$), sadness ($\chi^2=3.598$; $p=0.308$), being lazy or demotivated ($\chi^2=0.751$; $p=0.861$), fearful or anxious ($\chi^2=0.686$; $p=0.877$), hopeless ($\chi^2=0.356$; $p=0.949$), helpless ($\chi^2=0.530$; $p=0.912$), impatient ($\chi^2=1.861$; $p=0.602$), withdrawn or isolated ($\chi^2=1.041$; $p=0.791$), and paranoid ($\chi^2=4.799$; $p=0.187$) are considered not significant at 0.05 level. Thus, the results show that both male and female students of Quezon City University experienced a similar level of cabin fever symptoms according to the results of their self-reported cabin fever symptoms assessment.

This study reveals that gender has nothing to do or does not directly influence the manifestation of the symptoms of cabin fever. It is important to note that anyone can have a mild to severe cabin fever symptoms during the pandemic. Therefore,

this study accepts the null hypothesis, stating that there is no significant difference between the self-reported symptoms of cabin fever among college students of Quezon City University during the implementation of the community quarantine in Metro Manila in terms of their gender.

However, Verma et al. (2011) stated that men and women tend to react differently with stress, both psychologically and biologically. In addition, historically, it was found out that women report higher level of stress than men. Not only do men and women manage stress differently, they also place a different level of importance in doing so (www.apa.org/news)

3.6 Self-reported associated effects of community quarantine and cabin fever in terms of gender

Table 12 shows the distribution of the responses of the students towards the self-reported associated effects of community quarantine and cabin fever in terms of gender. As gleaned from the table, both gender agreed that they experienced a sudden change in grooming, loss or gain of weight, trouble or having difficulty in concentrating, food cravings, changes in eating habits, difficulty in waking up, difficulty in sleeping, frequent napping or sleeping too much, struggle to start on doing things, and engaging in snapping at people or developing short temperament during the implementation of the community quarantine in Metro Manila.

Table 12. Self-reported associated effects of community quarantine and cabin fever in terms of gender

Effects	Level	Gender		Total
		Male	Female	
Sudden change in grooming	Agree	34 (46.58)	68 (37.99)	102 (40.48)
	Disagree	17 (23.29)	64 (35.75)	81 (32.12)
	No Comment	22 (30.14)	47 (26.26)	69 (27.38)
	Total	73	179	252
Loss / gain of weight	Agree	53 (72.60)	125 (69.83)	178 (70.63)
	Disagree	11 (15.07)	33 (18.44)	44 (17.46)
	No Comment	9 (12.33)	21 (11.73)	30 (11.90)
	Total	73	179	252
Trouble / Difficulty Concentrating	Agree	30 (41.10)	97 (54.19)	127 (50.40)
	Disagree	27 (36.99)	62 (34.64)	89 (35.32)
	No Comment	16 (21.92)	20 (11.17)	36 (14.29)
	Total	73	179	252
Food cravings	Agree	49 (67.12)	146 (81.56)	195 (77.38)
	Disagree	14 (19.18)	20 (11.17)	34 (13.49)
	No Comment	10 (13.70)	13 (7.26)	23 (9.13)
	Total	73	179	252
Changes in eating habits	Agree	51 (69.86)	133 (74.30)	184 (73.02)
	Disagree	14 (19.18)	28 (15.64)	42 (16.67)
	No Comment	8 (10.96)	18 (10.06)	26 (10.32)
	Total	73	179	252
Difficulty waking	Agree	39 (53.42)	93 (51.96)	132 (52.38)
	Disagree	21 (28.77)	67 (37.43)	88 (34.92)
	No Comment	13 (17.81)	19 (10.61)	32 (12.70)
	Total	73	179	252
Difficulty sleeping	Agree	53 (72.60)	128 (71.51)	181 (71.83)
	Disagree	11 (15.07)	38 (21.23)	49 (19.44)
	No Comment	9 (12.33)	13 (7.26)	22 (8.73)
	Total	73	179	252
Frequent napping / sleeping too much	Agree	40 (54.79)	83 (46.37)	123 (48.81)
	Disagree	23 (31.51)	73 (40.78)	96 (38.10)
	No Comment	10 (13.70)	23 (12.85)	33 (13.10)
	Total	73	179	252
Struggled to start on doing things	Agree	34 (46.58)	105 (58.66)	139 (55.16)
	Disagree	22 (30.14)	52 (29.05)	74 (29.37)
	No Comment	17 (23.29)	22 (12.29)	39 (15.48)
	Total	73	179	252
Engage in snapping at people / short temperament	Agree	27 (36.99)	60 (33.52)	87 (34.52)
	Disagree	27 (36.99)	75 (40.78)	102 (40.48)
	No Comment	19 (26.03)	44 (24.58)	63 (25.00)
	Total	73	179	252

Table 12 reveals that both gender agreed that they experienced the identified effects of community quarantine and cabin fever during the time of pandemic. This result is supported by the Chi-square test results in Table 13.

Table 12 reveals that 40.48% of the respondents agreed that they observed that they experience sudden change in grooming, while 32.12% of them disagreed, and 27.38% has no comment on this. In terms of gender, number of male and female respondents who responded on the associated effects of community quarantine and cabin fever is almost the same.

Majority or a total of one hundred seventy eight (or 70.63%) of the respondents reported that they either loss or gain weight during the implementation of the community quarantine. While forty four or 17.46% and thirty or 11.90% of the respondents said that they disagreed or no comment. In terms of gender, number of male and female respondents who responded on the associated effects of community quarantine and cabin fever is almost the same.

Half of the respondents or 50.40% of the respondents reported that they agreed that they have experience trouble or difficulty in concentrating during the implementation of the community quarantine, while 35.32% of them reported that they do not experience it. And 14.29% of them have no comment on this identified effect of community quarantine or cabin fever. In terms of gender, more female respondents as compared to male respondents reported that they experienced trouble or difficulty in concentrating during the implementation of the community quarantine. While most of the males responded disagree or no comment as compared to females.

Table 12 shows that 77.38% or one hundred ninety five of the respondents reported that they experienced food cravings during the implementation of the community quarantine, while 13.49% or thirty four of the respondents reported that they do not experience it. 9.13% of them have no comment on this identified effect of community quarantine or cabin fever. In terms of gender, more female respondents as compared to male respondents reported that they experienced trouble or difficulty in concentrating during the implementation of the community quarantine. While most of the males responded disagree or no comment as compared to females.

Majority of the respondents of equivalent to 73.02% of the respondents reported that they experienced changes in their eating habits during the implementation of the community quarantine, while 16.67% of them disagreed. In terms of gender, number of male and female respondents who responded on the associated effects of community quarantine and cabin fever is almost the same as shown in Table 12.

In terms of experiencing a difficulty in waking up in the morning during the community quarantine, majority of the respondents or equivalent to 53.38% agreed that they experienced it as shown in Table 12, while 34.92% of them reported that they do not experience the same while 12.70% has no comment on this reported effect of community quarantine and cabin fever. In terms of gender, number of male and female respondents who responded on the associated effects of community quarantine and cabin fever is almost the same as shown in Table 12. This result might be associated to the fact that majority of them are going online and do some online

activities during the community quarantine, and might cause them to sleep very late.

Furthermore, in terms of experiencing having some difficulty in sleeping at night, majority of the respondents or equivalent to 71.83% reported that they experienced difficulty in sleeping during the implementation of community quarantine, while 19.44% of them reported that they do not experience the same. Twenty two of the respondents or 8.73% have no comment on this. In terms of gender, number of male and female respondents who responded on the associated effects of community quarantine and cabin fever is almost the same as shown in Table 12. This result might be associated to the fact that majority of them are going online and do some online activities during the community quarantine, and cause them to sleep very late.

Table 12 reveals that majority of the respondents or 48.81% reported that they experienced frequent napping or sleeping too much, while 38.10% reported that they do not experienced the same situation during the implementation of the community quarantine. Table 12 also shows that thirty three of the respondents (13.10%) have no comment on this. In terms of gender, number of male and female respondents who responded on the associated effects of community quarantine and cabin fever is almost the same as shown in Table 12.

Half of the respondents or equivalent to 55.16% reported that they struggled to start on doing things during the implementation of the community quarantine, while 29.37% said that they do not experienced the same while on a lockdown. And 15.48% of them have no comment regarding on this identified effect. In terms of gender, number of male and female respondents who responded on the associated effects of community quarantine and cabin fever is almost the same as shown in Table 12.

Lastly, almost half or 40.48% of the respondents reported that they do not experience on engaging in snapping at people or develop short temperament during the implementation of the community quarantine, while 34.52% of the respondents, which is quite closer to those who said that they do not engage in snapping at people or develop short temperament reported that they do engaged in snapping at people or developed short temperament during the lockdown.

Table 13. Chi-square Test Results of the Self-reported associated effects of community quarantine and cabin fever in terms of gender

Symptoms	χ^2	df	Asymp. Sig. (2-sided)
<i>Physical</i>			
Sudden change in grooming	3.737	2	0.154
Loss / gain of weight	0.409	2	0.815
<i>Mental</i>			
Trouble / Difficulty Concentrating	6.036	2	0.049*
<i>Psychological</i>			
Food cravings	6.213	2	0.045*
Changes in eating habits	0.570	2	0.752
Difficulty waking	3.249	2	0.197
Difficulty sleeping	2.545	2	0.280
Frequent napping / sleeping too much	1.954	2	0.376
Struggled to start on doing things	5.446	2	0.066
Engage in snapping at people / short temperament	0.533	2	0.766

*Significant at 0.05 level

Table 13 reveals that the Chi-square values for the self-reported associated effects of community quarantine and cabin fever in terms of gender. Effects on physical factors such as sudden change in grooming ($\chi^2=3.737$; $p=0.154$) and loss or gain of weight ($\chi^2=0.409$; $p=0.815$) shows no significant difference.

However, research shows that men are less likely than women to believe that stress can impact their body/physical health. In addition, women are substantially more likely than men to say that they have tried to reduce stress over the years (www.apa.org/news). Furthermore, Table 13 also reveals that the reported effects on mental factor, such as having trouble or difficulty in concentrating ($\chi^2=6.036$; $p=0.049$) shows a significant difference. This gender difference shown that majority of the females reported that they experience difficulty in concentrating as compared to males (see also Table 12).

Effects on psychological factors reveals that the reported effects such as changes in eating habits ($\chi^2=0.570$; $p=0.752$), difficulty in waking up ($\chi^2=3.249$; $p=0.197$), difficulty in sleeping ($\chi^2=2.545$; $p=0.280$), frequent napping or sleeping too much ($\chi^2=1.954$; $p=0.376$), struggling to start on doing things ($\chi^2=5.446$; $p=0.066$), and engaging in snapping at people or having a short temperament ($\chi^2=0.533$; $p=0.766$) during the implementation of the community quarantine shows no significant difference among male and female respondents.

Maestriepieri (2012) stated that according to Psychologists, there is a basic difference in the way men and women respond to social stress. For men, it is “flight or fight” while for women it is “tend and befriend”. Taylor (2000) as cited by Maestriepieri (2012) mentioned that when it comes to stress, women are different from men. Instead of getting ready to fight or to flee, women become more likely to express affiliative social behaviour, either befriend the enemy or to seek social support from their family members and friends. In addition, instead of releasing large amounts of norepinephrine and cortisol into bloodstream like men, women respond to stress by secreting more endorphins that help alleviate pain and make us feel good about social interactions and oxytocin that is linked on motivation to behave in a friendly manner.

Interestingly, among the identified effects under psychological factors, food cravings ($\chi^2=6.213$; $p=0.045$) shows a significant difference on the self-reported associated effects of community quarantine among male and female respondents. This denotes that most of the females agreed that they experience sudden food cravings during the implementation of the community quarantine as compared to male respondents.

Generally, the results show both male and female students of Quezon City University reported similar effects of community quarantine leading to cabin fever based on the results of their self-reported cabin fever symptoms assessment. Therefore, this study accepted the null hypothesis, stated earlier that there is no significant difference between the self-reported effects of cabin fever among college students of Quezon City University during the implementation of the community quarantine in Metro Manila in terms of their gender.

3.7 Interventions that may be used by educational leaders and parents to help the students to overcome the effect of cabin fever during the pandemic.

Based from the results, educational leaders and parents are highly encourage to optimize home as a multipurpose environment for both learning and recreation or entertainment, encourage students to read books especially those that they have missed out before or even re-read their favourite books, parents or teacher may also assigned schedules for book or chapter reading, encourage the students to listen to music, watch educational TV shows or educational video online, teach the students to follow certain schedules or develop a habit of dividing their time purposely, support virtual thematic discussions and group activities, encourage them to do some exercise and constantly remind them to look over with their health and diet. And lastly, the possibility for online discussion with a health professional or a psychologist is another concrete action that can help reduce anxiety and panic and overcome feelings of being alone or powerlessness (Zaharieva, 2020).

As the country and the rest of the world is still in the midst of the pandemic, people are forced to study and work from their home, and also find entertainment to avoid cabin fever and use their idle time indoors meaningfully (Co, 2020). This study reveals that for some people, being placed under home quarantine has given them time to get in shape physically, mentally, and psychologically. Others have resorted to online activities, learning new hobbies, and spending time with their loved ones to cope with the situation. However, it was also stressed out that remote learning and working arrangements, as well as online entertainment are not privileges everyone enjoys.

IV. CONCLUSION AND RECOMMENDATIONS

Cabin fever is one of the many effects of the implementation of the Community Quarantine to people. It is a cycle of negative and distressing emotions experienced by individuals as a result of being isolated from the society or shifting away from their usual social activities. Due to Covid-19 pandemic, people all over the world are currently experiencing this phenomenon as everyone stays at home for long periods of time, most especially students. Some of the symptoms of cabin fever includes stress, restlessness, impatience, being easily agitated or highly irritable, lethargy, decreased motivation, persistent sadness, low moods, having a sense of hopelessness, mistrust of people, poor concentration, poor sleep hygiene, food cravings and even weight changes.

This study revealed that both male and female college students in Quezon City University (QCU) experience a same level of symptoms of cabin fever, which is from none to mild symptoms as revealed by the results of their self-reported assessment. And generally, the results shows both male and female students of Quezon City University reported similar effects of community quarantine leading to cabin fever based on the results of their self-reported cabin fever symptoms assessment. However, the study revealed a gender difference towards the associated effects of community quarantine that might lead to cabin fever in terms of mental and psychological

factors, such as having trouble or difficulty in concentrating and food cravings, where in most of the females agreed that they experience having trouble or difficulty in concentrating and sudden food cravings during the implementation of the community quarantine as compared to male respondents.

It is highly recommended that parents and teachers should optimize home as a multipurpose environment for both learning and entertainment, encourage students to read books especially those that they have missed out before or even re-read their favourite books, parents or teacher may also assigned schedules for book or chapter reading, encourage the students to listen to music, watch educational TV shows or educational video online, teach the students to follow certain schedules or develop a habit of dividing their time purposely, support virtual thematic discussions and group activities, encourage them to do some exercise and constantly remind them to look over with their health and diet. And lastly, whenever the symptoms of cabin fever becomes worst, it is encourage to consult with a health professional or a psychologist to help reduce anxiety and panic and overcome feelings of being alone or powerlessness.

The University through the Office of Students Affairs and Guidance, Testing and Placement Office and other related offices should create a program to constantly monitor the physical and mental state of the students. In addition, activities that will promote mental health awareness and wellbeing while the students are at home should be utilized also. Programs and activities should be done online through zoom meetings or Google meet to name a few. And since, this study does not consider the nature of the students either extrovert or introvert, it is highly recommended to conduct a similar study that focus on the effects of cabin fever to introvert and extrovert type of students.

It was recommended for future researchers to consider studying the relationship of student's personality types to the possible changes in behaviour that they have experienced while they are in community quarantine.

ACKNOWLEDGMENT

The researchers would like to thank all the students of Quezon City University who participated in this study despite the pandemic, and to the QCU administration, faculty and staff. The researchers would also like to acknowledge the support and patience of their family during the conduct of this study. Special thanks to Ms. Cecille Tenecio-Tamalla for the map used in this paper.

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Teaching Purposive Communication in Higher Education Using Contextualized and Localized Techniques

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DOI: 10.29322/IJSRP.10.09.2020.p105103

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p105103>

Abstract- The study focuses on exploring the implications of contextualized and localized techniques on teaching and learning the subject Purposive Communication. A true experimental design is used to determine the implications of the used techniques in teaching the General Education core subject as well as its significant effect on students' performances. Two groups of first year college students from Quezon City University are randomly selected to participate in this study. Using independent sample t-test, results showed that there is a significant improvement on the performances of the students under the experimental group as compared to those in the control group. The study suggests that the contextualized and localized technique are effective in supporting the teaching and learning process in higher education.

Index Terms- Contextualized and localized techniques, Teaching strategies, English Education, Teaching and Learning.

I. INTRODUCTION

Communication is one of the essential skills that a 21st Century learners should acquire according to Alismail and McGuire (2015). Muego, Acido, and Lusung-Oyzon (2016), state that developing good communication skills, both in written and oral among Filipino learners, most especially in the tertiary education is pivotal for ensuring success in education as well as in professional life in the modern world.

Furthermore, acquiring proficiency in English language is mandatory for every Filipino students as English enjoys the status of one of the official languages in the country. Also, it is the language of science, education, politics, business and commerce, according to Separa, Gerales, and Medina (2019). In addition, it is the medium of instruction for higher education at tertiary level institutions in the Philippines, thus, having a better English language and communication skills are an essential ingredient for academic success. Tupas, and Ruanni (2002), opine further that English language is taught as a compulsory subject for twelve years in the basic education in the Philippines with the goal of developing Filipino learners to have a proficient skills in English language and communication.

However, based from the study of Ramos (2015), traditional methods and techniques used in the Philippines, especially in teaching communication and other English subjects to develop necessary skills used in majority of Filipino classrooms has not produced proficient English speakers and

readers who can confidently and autonomously speak and read English in and outside the classrooms, according to Loyola (2018).

Ramos (2015) and Pangalangan (2008) even emphasized that Philippine English classes are mostly dominated by traditional methods of teaching. Loyola (2018) stresses that Rote learning and translation methods are commonly used for teaching core subjects and students rarely develop sufficient skills. In addition, he states that the lack of speaking, reading and writing in English culture in the Philippine society is also a hindrance in developing English communication skills among Filipino students.

According to Madrunio, Martin, and Plata (2016), aside from other hindrances, like ineffective textbooks and extremely limited resources, the methods employed by teachers to teach English courses remains one of the main causes behind students' poor communication and reading skills. They also discussed that majority of teachers use traditional lecture based methods to teach English subjects in their classroom and does not show much evidence of proper planning. Furthermore, there is little emphasis on using strategies that encourages the students to become actively involve and participate in the lesson. The examples used in class are not based on local, personal, and real life experiences. This is the reason why there is no focus on developing metacognitive awareness in general.

Ramos (2015) and Pangalagan (2008), explain that the traditional teaching methodology and techniques used in teaching English subjects has proven ineffective and a pressing need for adopting or using more current and effective methods and techniques in teaching the subject is necessary. In addition Chan (2019), Fallah and Nazari (2019), Teng (2019), and Manurong (2007), reveal that studies on English teaching and learning across the world tested and evaluated various teaching methodologies, and strategies and techniques that can be used to enhance and develop communication, reading, and comprehension skills of the students, as well as their academic success. To simply put in, through the use of combined various teaching methods, and strategies and techniques students become more aware of the process of learning, participate actively in class, and gradually become autonomous learners.

Moreover, according to Bringas (2014) and Bird, Livesey, and Simon (2011), contextualized and localized techniques in teaching are two of the various techniques that a teacher can be used to improve his or her teaching and students' academic performances. Chew (2008), stresses that contextualized

technique provides a paramount ways of establishing young learners' English proficiency because they are made to engage in tasks and topics which relate to the circumstances and situations that require the use of language. On the other hand, localization technique is a subfield of contextualization where in teachers utilize the local tradition and culture of the students in both instruction and assessment, according to Center for Occupational Research and Development (2012). In addition, it is the process of relating learning content specified in the curriculum to local information and materials from the learner's community, according to Garin, Reyes, Domantay, and Rosals (2018). Crawford (2002) particularly points out that with the use of these techniques, students will be able to conceptualize the presented materials in class and drag and store it in a long-term memory space of their brains, because the concepts are presented in meaningful and contextual ways.

Celce-Murcia, Dornyei, and Thurrell (1995), state that learning becomes meaningful when it is transferred from one context to another. Students' knowledge should be connected to the real world and to their previous and present experiences, as well as to their present environment. Similarly, Celce-Murcia, Dornyei and Thurrell (1995), point out that to make learning effective, knowledge should be contextualized with the prior understanding of the learners. In addition, as a facilitator of learning, teachers should serve as a catalyst to recall the past memories, concepts, or experiences of the learners and help them to connect it to the present, so that they can use prior knowledge in a useful and meaningful way.

Moreover, according to Lee and Yee-Sakamoto (2012), in the contextual curriculum, learners are encouraged to learn within the compatible environment for learning. This compatible environment for learning is mainly associated with community centered, learner centered and knowledge centered learning. Mediha and Enisa (2013), state that in this sense, contextual curriculum enhances the social and/or public pedagogy and personal pedagogy for the contextual learners. Mouraz and Leite (2013) opine further that contextual learners set the environment of learning where knowledge is connected with the context. Perin (2011) on the other hand explains that teacher's conceptual and analytic tools must acknowledge the importance of the local, thus, this serve as a call for highlighting the contexts, conditions, and processes of teaching and learning in a localized-based setting.

Garin, Reyes, Domantay and Rosals (2018) even emphasize that although there are number of studies that highlight the use and effects of contextualized and localized techniques in teaching, there are limited studies that has been carried out on exploring the efficacy of localized and contextualized technique in teaching English subjects community, such as Purposive Communication in the Philippines. And because of these claims, educational leaders at present encourage teachers to use and adopt localized and contextualized techniques in teaching various subject matter.

In line with these development, the researcher tried to investigate if using contextualized and localized techniques in teaching the subject Purposive Communication also produce a significant improvement on students' academic performances.

II. METHODOLOGY

The study was conducted in Quezon City University, Quezon City, Philippines, sometime in February 2019, during the second semester of the academic year 2019–2020. The respondents were composed of a total of sixty (60) freshmen college students under the General Education (GenEd) Program of the university. Students were divided as control ($n = 30$) and experimental ($n = 30$) groups. They were assigned randomly. The experimental group received the contextualized and localized technique of teaching the subject Purposive Communication, where in the researcher discussed the topics in a contextualized manner and used local materials, examples, conversations, formative tests in presenting the topics, while the control group does not, and undergone a usual lecture discussion technique.

The topics and objectives were based on the outcomes-based course syllabus used in the subject Purposive Communication which is also in lined with the CHED Memorandum Order No. 2, series of 2013. The same topic about the nature of communication and objectives were given and used in both groups except for the teaching strategy employed for one week. Each group was given a posttest examination using a 30 item test questionnaire which was developed by the researcher. Prior to the experimentation, the test questionnaire was evaluated by five English teachers for its face validity, and a total of fifteen (15) freshmen college students who are not part of the experiment took the test to determine its reliability. Chronbach alpha test revealed a reliability coefficient of 0.78 which denotes that the test questionnaire has a high internal consistency. The result of the examination of each group was analyzed using independent sample t-test to draw a sound and valid conclusion on the implications of contextualized and localized technique on teaching and learning.

III. RESULTS AND DISCUSSION

Data were analyzed by using IBM SPSS STATISTICS version 22. Before analyzing the data, all assumptions of the analysis were checked.

Table 1 shows that the mean score of control group is 18.20 with a variance of 6.097, while the mean score of the experimental group is 25.87 with the variance of 7.982. The result denotes that students under the experimental group perform better in their posttest examination as revealed by their group mean score value. The use of contextualized and localized techniques in teaching the subject Purposive Communication help the students to improve their performances in class. This result is similar to the study conducted by Garin, Reyes, Domantay, and Rosals in 2017 and 2018 concerning the effects of contextualized and localized techniques in teaching statistics and basic government-academe-industry network. They found out that the performance of the the students who are exposed with the contextualized and localized technique was significantly performed better as compared to those group who are not. Furthermore, their finding indicates that using indigenous data in teaching serves as an effective teaching and learning strategy that a teacher can use in his or her classes.

Table 1. Mean Score of the Post-test Examination

Group	Count	Mean	Variance
Control	30	18.20	6.097
Experimental	30	25.87	7.982

To support the claim of this study, Table 2 shows that result of the independent sample t –test that is used to investigate whether there is a significant difference between the results of the posttest examination results of the control and experimental groups. The results shows that the computed t -value is 0.04 with 58 degrees of freedom (df). This value is significant at 0.05 level of confidence since the computed t -value is greater than the critical value which is 2.002.

Table 2. Result of the Independent-sample t-test of the Post-test Examination

Test	t-stat	df	p-value	t-crit	Upper	Lower	Significant*
Two Tail	11.192	58	0.000	2.002	-9.038	-6.295	yes

*Alpha = 0.05

Literature and studies support the claim of this study that contextualization and localization can be used across learning areas (Garin, Reyes, Domantay, and Rosals, 2018, 2017, in press; Bringas, 2014). And also localization maximizes the available materials, activities, events, and issues within the local environment (Garin, Reyes, Domantay, and Rosals, 2018, 2017, in press; Bringas, 2014). Furthermore, it also supports the idea that contextualization is necessary in addressing the content and organization of activities that will be used in the teaching and learning process. And lastly, the results of this study support the claim of Garin, et al. (2017) and Mouraz and Leite (2013) that contextualization and localization support students' engagement in their schoolwork because they are taught on why they are learning specific concepts and how they can use it in the real-world.

IV. CONCLUSION AND RECOMMENDATIONS

The result of the posttest examination of the experimental groups who are exposed to contextualized and localized teaching is higher than the control group who received a traditional lecture-discussion method. Generally, under the randomized posttest-only control group design, the group of students who are under the experimental group and exposed to contextualized and localized teaching performed better compared to the group of students who are not exposed to contextualized and localized teaching technique. Thus, contextualized and localized teaching technique helps to improve the teaching process as well as the academic performances of college students most especially in the subject Purposive Communication.

Based from the results of this study, it is deemed necessary that teachers in the tertiary level should adopt and try using localized examples, exercises, and illustrations in teaching English subjects, specifically in developing students' communication skills. Furthermore, instructional material developers, educational leaders, and book writers should promote

the utilization of indigenous materials and locally-based selections in teaching Purposive Communication as one of the suggested teaching-learning strategy to teachers in the tertiary level. Lastly, teachers should use and incorporate authentic and indigenous instructional materials so that the teaching and learning process becomes more effective and long lasting.

ACKNOWLEDGMENT

The researchers would like to thank all the students of Quezon City University who participated in this study despite the pandemic, and to the QCU administration, faculty and staff. The researchers would also like to acknowledge the support and patience of their family during the conduct of this study. Special thanks to Ms. Cecille Tenecio-Tamalla for the map used in this paper.

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The Effects of Trade Deficit in Nepal's Economy

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DOI: 10.29322/IJSRP.10.09.2020.p105104

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p105104>

Abstract- Nepal is encountering a consistent trade deficit throughout the decades. For certain economist, trade deficit, alone isn't an issue. They contend that if an economy makes a major venture or when individuals devour more than they broadly produce, a trade deficit happens. In any case, long term trade deficit in any economy can't be seen as a positive sign. An economy can scarcely sustain a continuous trade deficit that has been seen in Nepal. This paper has mentioned and explored the reasons and causes of Nepal trade deficit which can also be seen in many other countries. To get the result in the paper we have used Regression method in order to analyze the effects of trade deficit in Nepal's economy. Time series data from 2000/01 to 2017/18 are used in the paper followed by regression method utilized to clarify the effect of trade deficit. The fundamental driver of trade deficit are government issues and discord, budget unavailability, geological arrangement. The result shows a noteworthy negative effect of the trade deficit on the economy of Nepal.

Index Terms- Human Development Index, Trade Deficit, Gross Domestic Product, Gross fixed Capital Formation.

I. INTRODUCTION

Nepal's trade balance in context of goods and services have been in shortfall for a long period of time. The huge deficiency has not brought about any significant assortment of average foreign liabilities, where the economy to a great extent is financed with remittances from overseas. Actually, a huge part of the expansion in the trade deficit is clarified by the remittances. Trade deficit in Nepal is reasonably sturdy and complex to strategy malleable factors, for example, government consumptions or credit. Government consumption had a huge responsibility on the trade deficit, however at lesser portion. Trade whether it is domestic or global can be is deliberated as one of the critical significant variables to sustainable development, employment advancement and benefits of the individuals. International trade grows significant at a point where the nation is not independent in fundamentals productions also at expenditures and capital goods. There are many challenges that Nepal faces in context of foreign trade. Its major feature is that it is a land-locked country located between two large and powerful countries: India and China.

The trade with India is growing even for basic consumptions in a huge amount whereas exports are very low comparatively. The labors here are costly that produce low quality products and majorly the government is instable and the policy is discrete. It is clear that the balance of trade is negative as the imports are higher than the exports in almost every perspective.

Nepal fundamentally involves in agriculture exporting agricultural goods, handicraft goods, crude material which does not meet international standards and convey insignificant foreign exchange to its capital. The slow development in export contrasted with the vigorous development in import stays a significant distress for Nepal to gain profit in terms of trading. The overall development in export was 4.2% in the most recent decade though development in import during a similar period was 18.2 percent. India has been continuously involved majorly on the biggest export target of Nepalese products and enterprises with engrossing 66 percent of total Nepal's export. In spite of being one of the largest and powerful country, China consumed 2.8% of Nepal's complete export averagely over recent years though it tends to be rising consequently. Nations except India and China assimilated very nearly a fourth of the total export throughout the last decade. Woolen carpets, readymade garments, pashmina involved practically 50% of the all-out exports to different nations.

Nepal lacks in a lot of modern technologies that leads to industrialization growth, in recent history, Nepal has gradually moved from agriculture sector to service sector, there is a gap in industrialization growth. Therefore, Nepal does not have well-equipped industrial cores leading to the lack of quality products, making our products uncompetitive in global market. Low capital formation is another problem for foreign trade that stops the foreign economic activities. Like we mentioned that Nepal does not have well- equipped bases and modern infrastructures this lacks potential environment for local as well as foreign investment leaving the nation dependent on internal investment with low capital foundation for expansions and growth. All reasons combined, it is sad to say that Nepal lacks skillful laborers, education and knowledge about modern technologies so to have the competitive advantage over the

II. LITERATURE REVIEW

A study have utilized board data examination to assess the impact of trade liberalization over export execution, import execution, the equalization of trade and the balance of payment for an example; taking illustration of 22 developing nations that have received trade liberalization approaches since the mid-1970s. They found that advancement invigorated export execution yet raised import execution by more, prompting an intensifying of the balance of trade and payments. (Santos-Paulino & Thirlwall, A. P. , 2004)

External sector of Nepal is accurately incapable with constantly expanding trade deficit. Export engaged on flooding in the ongoing years and imports stayed unstable. In spite of the fact that the development pace of exports out-placed that of imports,

trade deficit extended for the most part because of relative bigger volume of imports (R & Sharma, S. K. , 2002). The import additional ventures and export oriented businesses may push the nation to come out of the persistent trade deficit. Trade deficit has been mostly financed by remittance inflows, along these lines the volume and indication of current record is generally dictated by volumes of imports and remittance from abroad.

The economic development execution of Nepal has stayed inactive as well as, in qualified to the degree of investment in the economy, likewise unassuming. It might value referencing that, for accomplishing economic advancement purposes in a situation of smooth and stable full scale economy, saving and investment must be beneficial. The huge breach between exports and imports ought to be reasonably limited. Toward these closures, extreme utilization and pointless imports needs to be ignored. Comprehensive arrangement and incentives ought to be worked to guarantee that the assets are beneficially used. The government instructions and administration arrangements also, plans should help guarantee such a structure both with ostensible pay, is negative. The outcomes demonstrate a small sensitivity of per capita salary development to the trade openness development. The discoveries uncover that the efficiency profits by extra trade are higher for the trading accomplices of Nepal than themselves. He contends that Nepal has liberalized trade without presenting proper internal approaches and establishments. (Basyal, 2011.)

With the presentation of liberal trade and monetary arrangements, Nepal saw the greater part of the youthful population going abroad each year in the hunt of work abroad in the ongoing decades on account of economic also for studying purposes. The business related migration, excluding India, expanded from around ten thousands in mid 1990s to in excess of 300 thousands of every (DOFE, 2010). This displacement came about to a sharp ascent in commitment of remittance to GDP from 2 percent in mid 1990s to 23 percent in 2009 which additionally fortified the general parity of payment situation and its offer in current record receipts (World Bank, 2011) .Out of all out 55.8 percent families getting remittance in Nepal, the percentage of rural areas is 58 percent, Due to remittance inflow stream to the provincial area, the country urban movement has expanded forcefully. Furthermore, studies demonstrates a critical decrease of poverty frequency and disparity because of the elevated level or remittance flow. Such progression of pay infiltrate the far rural areas and the least fortunate areas of society giving the immediate admittance to money.

Magee S.P was the first to see that the U.S. trade balance disintegrated regardless of depreciation of the dollar in 1971. He at that point hypothetically contended that it is workable for the trade balance to disintegrate resulting to cash deterioration, for the most part because of slacks in the reaction of trade flow to a change in exchange rate yet once the slacks are acknowledged at that point inevitably the trade balance improves. (Magee, 1973) The study was examined to show the real exchange rate and trade balance correlation in Malaysia for a period 1955 to 2006, their empirical examination demonstrated that there is a presence of long-term connection between trade balance and exchange rate, significant factors that were critical incorporates the internal as well as foreign income. Their outcomes moreover shown the no j-curve impact in Malaysia. (wai-mum, Ng yuen-ling, & Tan Geoi-Mei, 2008)

Pakistan is confronting a trade deficit during a decades ago because of quick development of imports when contrasted with unobtrusive exports. Solid financial development causes rising domestic interest that expanded investment level that prompts increment the country's imports necessities. Basic change in Pakistan's money associated agenda offer growth to extensive increment in imported capital supplies and mechanical fragmented assets at the expense of imported consumer items. However, effectiveness of any country's worldwide trade policy much of the time depends upon the degree of income and cost flexibility of its imports and exports just as it relies upon exchange rate and precariousness of it which manages trade openness, deduction of limitations, and approval of tariff plan and protectionist policies regarding trade. As the regular import demand speculation has a microeconomic premise, it is underlying on the consumer hypothesis of demand, and this hypothesis expresses that the point of the consumer is to augment fulfillment. Degree of individual interest for imports sets up the all-out imports demand for the country's economy. (Hassan, Wajid, A, & Kalim, R., 2017)

III. DATA AND METHODOLOGY

3.1 Data Source

Trade deficit in Nepal is a major concern as it is leading to decimating occupations, discouraging wages, having low competitive advantage over global products and adding to the monotonous living standards that has been leading to tormented economy. Numerous endeavors have been concocted to make monetary reasons for the trade deficit. It is said that trade deficit is not a big deal whereas few states that trade balance leads in determining of factors related to macroeconomic. Either perspectives propose that trade deficit will be generally lethargic to trade strategies, and might be securely disregarded, as long as the country is succeeding strong macroeconomic arrangements. Continuous trade deficit in context of Nepal have let down the country's economy. Nepal is importing more products from other countries like India and China majorly, and the local products are not being able to compete over these foreign products. As we see the overall trend, we get the idea that the manufacturing sectors are more affected because of the reason that the import is exceeding whereas the export is continuing in a very slow pace. than that of export. Now this resulting in lak of employment, jobs with less income, cause of the competition. Less the employment less the economic growth, leading to more import and more trade deficit.

Fiscal Year	GDP (Current Price)	Trade Balance	HDI	GFCF
2000/01	44151.9	-6003.31	0.446	8475.06
2001/02	45944.3	-6044.42	0.447	8988.93
2002/03	49223.1	-7442.15	0.457	9807.28
2003/04	53674.9	-8236.64	0.462	10918.13
2004/05	58941.2	-9076.79	0.469	11753.89
2005/06	65408.4	-11354.6	0.475	13553.2
2006/07	72782.7	-13531.2	0.486	15333.69

2007/08	81565.8	-16267.1	0.491	17844.55
2008/09	98827.2	-21677.1	0.502	21103.9
2009/10	119277.4	-31351.1	0.514	26488.75
2010/11	136695.4	-33183.7	0.529	29273.04
2011/12	152734.4	-38740.7	0.535	31718.46
2012/13	169501.1	-47982.2	0.548	38297.18
2013/14	196454	-62237.4	0.554	46201.34
2014/15	213020	-68936.5	0.56	59582.26
2015/16	225316.3	-70348.2	0.566	64729.39
2016/17	264259.5	-91706.4	0.569	84069.27
2017/18	300724.6	-11616.3	0.574	105195.72

Source: Ministry of Finance, Government of Nepal.

At last, trade deficit have excluded of high-wage manufacturing employments. They have additionally squeezed the wages of laborers, by taking out steady employments as well as by lowering down the costs of local items and by diminishing work's bargaining power with worldwide firms. At last, trade deficit have diminished interest in innovative work, consequently subverting productivity development and adding to the stagnation of salaries that has tormented our economy. regression model is used. The accompanying condition that is mentioned below is applied to measure model

3.2 Model Specification

The econometric model used in this assessment endeavors to explain the impact of the dependent factors with independent factors. In-order to assess the impact of the trade deficit on overall Nepal's economy regression model is used. The accompanying condition that is mentioned below is applied to measure model.

$$GDPit = \beta_0 + \beta_1TDit + \beta_2HDIit + \beta_3GFCFit$$

Where, GDP = Gross Domestic Product, TD= Trade Deficit, HDI= Human Development Index and GFCF= Gross Fixed Capital Formation.

As we discussed above, we are well aware that a trade deficit can effect negatively as well as positively depending on Gross domestic product of different countries. A country that has trade deficit applies more cost for imports and the focus on export is eliminated and in short term period, a detrimental balance of trade results in inflation. Be that as it may, after some time, a generous trade balance debilitates local businesses then diminishes opportunities for employment. An immense dependence on imports likewise makes a nation powerless against financial aspects. Cash degradations, for instance, turns imports pricier which eventually results in inflation.

The Human Development Index was acquainted as a path that measure this methodology. HDI can possibly give a basic impression of improvement that can be unloaded to show advancement as for the Sustainable Development Goals. It tends to be utilized to supplement marginal shares of growth. Capital formation likewise impacts the financial government assistance of

a nation. It supports in organizing the prerequisites of an expanding populace in a developing country. At the point when capital formation prompts the accurate neglect of natural assets and the foundation of various sorts of enterprises, stages of salary increment and the differed needs of the individuals are fulfilled. They devour a variety of merchandises, their way of life grows and their monetary government assistance increments. An expansion in financial government welfare ceteris paribus means that the economy is doing well. It is, in any case, a consistent ascent in the pace of capital formation over the extended period of time that increases the flexibly of products, manage inflation also gets dependability within the economy.

3.3 Empirical Results and Analysis

In below mentioned study, the use of regression analysis is performed in order to analyze the impact of trade deficit in terms of Nepal's overall economy.

	Coefficient	Standard error	t-value	p-value
Intercept	-233155	27736.8	-8.40596	0.000**
t		5		*
Trade deficit	-1.43579	0.32366	-4.43608	0.001**
HDI	588546.4	58690.2	10.0280	0.000**
GFCF	0.318324	0.32002	0.99467	0.337
		7	6	
R square = 0.99				
Significance F = 0.000				

Here, “***” denotes significant at the 1% statistical level.

From above analysis, the consequence of regression determines a huge negative effect of the trade deficit on the Nepal's financial and economic development. Trade deficit is shattering jobs careers, demoralizing incomes, low competitive advantage over foreign products. The trade deficit has affected badly on the domestic division of economy. The country is getting more product from foreign countries where they import in low price and comparatively the local products are not being able to convey the demand of people in the price that foreign products are giving. The manufacturing and industrial sectors of Nepal are the most affected due to the reason where import is higher than that of exports. This impact had achieved less job careers or lesser benefit for workers, as a result of the test from imports leading to growing trade deficit. Less occupations mean less things are conveyed in the economy, which, accordingly, encourages considerably more imports and never ending trade deficit.

However, the byproduct of regression additionally determines that Human development performs critical favorable outcome on the economic development. On the off chance that a crucial component of economic development is permitting specialists to find and build up their competition, an expansion in the capacities and working's accessible to people ought to permit a greater amount of job benefits where they are generally beneficial. At the point when a nation has a high HDI, it basically

implies that the life expectancy is growing, the educational sectors are productive also the incomes are advanced. It shows that the nation is developed, so the trade can advance human development and assist nations with accomplishing the long term missions and goals by making changes in income and job benefits, especially for fragile systems.

Simultaneously, Gross Fixed Capital Formation (GFCF) additionally has a critical progressive effect on economical factors of Nepal. The connection among capital formation and economy improvement can turn out to be stimulating as far as the significance of growth within capital formation. It can be commonly approved, the primary motivation behind monetary and economic advancement is to fabricate capital gear on an adequate scale in order to expand efficiency in many fields related to Nepal economy which includes agriculture sector, farming, industrial sector, building of educational institutions, hospitals and clinics, roads and so on.

IV. CONCLUSION AND RECOMMENDATION

4.1 Conclusion

Hence, to sum up we state that there is a negative impact on Gross Domestic products in Nepal due to the trade deficit. A shortage in a nation prompts lower total interest leading to slower development. Over the long haul, resolute trade deficit disrupts the way of life. It can prompt unemployment in locally situated businesses. Correspondingly, the nation running deficiency must import monetary money to accomplish stability. It can additionally prompt money shortcoming and create complex import inflation. A nation can confront the setback of foreign money hold. Trade deficit is an impression of absence of cost/non-value intensity. Human development is basic for financial development as individuals are significant assets and they assume an indispensable function in monetary development of a country. Rise in GDP development rates, while dispersed similarly over a populace will prompt value. Be that as it may, on the other hand, human development as better nourishment and training are pre requirements for advancement. Therefore, we came up to a conclusion that financial development and human development are interrelated to each other. There is no uncertainty that gross fixed capital arrangement is also plays a vital role in the financial development and advancement of a country. So as to implement monetary movement the general public wishes infrastructures, technologies, gadgets, road and rail network, transportations, air terminals, phones, water framework, internet and different types of resources. Consequently, it appears glaringly evident that monetary development and advancement are unequivocally reliant on noticeable fixed capital.

4.2 Recommendations

The trade deficit can be balance out by two methodologies that we are going to mention below. The authorities and legislature have power to recover one's countries balance of trade. The first is the consumption exchanging approach. The legislature for this situation will attempt to convince foreign as well as domestic purchasers to expend a greater amount of domestic merchandise and less of products created externally in the economy. These strategies are not intended to decrease expenditure on products however to change the example of

spending from foreign merchandise to locally delivered products. If this tend to be fruitful, it is probably going to prompt a drop in import use and a climb in trade profit. The other methodology that administrations can take when managing trade deficit can be the consumption diminishing methodology. The administration utilizing this methodology attempts to dispose of some aspect of the total interest. This will have two chief impacts. Right off the bat, local people will purchase and expend less thus imports are probably going to drop. The second is that as makers discover wants of local people in local business debilitating they will attempt to breakdown to foreign business sectors.

ACKNOWLEDGEMENT

I would like to appreciate and give my thanks to my supervisor Zha Donglan. You have supported and been very attentive to my works. Your recommendation and guidance have helped me better my work. I would also like to give my appreciation to my university for giving us this opportunity to grow in a nice and learning environment with such helpful faculty members. Also, my classmates have been very supportive and inspired me.

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Separation Of Heavy Metals: Removal From Industrial Wastewaters And Contaminated Soil Using ICT Technologies and Conventional Method

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DOI: 10.29322/IJSRP.10.09.2020.p105105

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p105105>

Abstract- This article describes relevant separation techniques for determining the removal of heavy metals from solutions and soils to achieve top quality in this field. Every innovation is quickly identified, regular working conditions are introduced and the innovation is implemented. The techniques described include the chemical precipitation (hydroxide, sulfide reagents or carbonate), coagulation / aggregation, ion exchange, extraction of chelators, soluble extraction, complex formation, electrochemical processes, cementation, includes film processing, evaporation, absorption and coagulation / fixation, glasses . Several narrative examples are given, focusing on ways to reduce waste and treat lead-contaminated soil. The article ends with a brief discussion of important screening requirements in this area.

Index Terms- Heavy Metals, Industrial Wastewaters, Contaminated Soil, ICT Technologies, Conventional Method.

I. INTRODUCTION

Various specific methods have been established for removing/separating heavy metals from sewage and for the treatment of contaminated soil and groundwater. [7] [6]

To remove metals from solution, these unit processes include chemical precipitation (carbonate, hydroxide, sulfide), coagulation / coagulation, ion exchange, soluble extraction, immobilisation, synthesis, electrochemistry. Includes process, evaporation, filtration, membrane. Some studies are included in the technical publication which summarizes various physical/chemical methods for removing heavy metals. [5] Soil and groundwater can be contaminated with heavy metals through a variety of activities, including industrial waste, compost, and the use of PC_ticid pesticides.[4] For soils that are contaminated with natural toxins, you can consider various measures to treat the specific site, such as: thermal treatment, steam and air removal, chemical oxidation and microbial degradation. [10]

There are fewer treatment strategies for treating soils that contain minerals. In contrast to natural decomposition, metal is not damaged. [6] Minerals are the most important hazardous ingredients that cannot be ground or modified by chemical or high temperature methods proposed by latest interventions of ICT.

It must be processed or transformed into a structure that is as insoluble as possible so that it does not reappear in the soil. [2] [1] [5]

II. DATA TRANSMISSION SYSTEMS

Recently, information and communication technology (ICT) applications are becoming a valuable device for water treatment. Monitoring water quality from ICT is similar to location detection systems, information clouds, and machine learning components. Reserach emphasised the importance of information and communication technologies (e.g. total processing and cloud computing) for the continuous monitoring of the panels and the water quality. [2] [3] Currently, fuzzy conditions are gradually being used in real applications. [11] [12] Distributed computing enables large amounts of information and analysis without the use of computers in the vicinity. [6] One of the main focuses is the remote assessment of information recorded through websites. In addition, remote sensing is one of the most effective methods of collecting field information. [9] [8]

The results indicate several factors that should be considered for the extensive use of on-site detection technology to control water quality (e.g. interoperability, energy consumption, unwavering quality, ease of use, security). [1] First, it highlights the importance of ongoing information and interoperability between device bases to reduce incremental information. Second, the low power consumption of the detection frame is essential for stable information transfer between the field sensor and the information stage. [2]

Third, reliability and ease of use are essential in the information phase. The authors describe the component-rich work phases and limit further efforts to improve information structure planning and to promote outreach innovations. Finally, the importance of adequate security efforts through encryption and authentication procedures is emphasized in order to provide continuous information to the public. Continuous advances in inexpensive wired or remote technologies enable simple and continuous information exchange from electronic information levels and improve the usability of information for water quality management. [4] [5] [6] [7]

III. FINDINGS

The particle size of the absorbent has an incredible impact on the absorption of heavy metals from wastewater. [5] This is because internal diffusion, which is the mass exchange for penetration into the adsorbent, is less restrictive the smaller the particle size. You can easily and practically achieve the full absorption capacity. Larger particles can get so large that they cannot get into the small pores where absorption can be freely reduced for several reasons. [4]

With increasing particle size, longer reaction times are required in order to achieve comparable results due to the diffusion through the agglomerates. [2]

In most cases, the absorption limit to increase absorption increases with increasing metal concentration and reaches a maximum at a certain concentration. [1] [2] [3] The ICT is able to "work on today's problems without affecting the needs of future people", function naturally, and build a conscious future. [5] For example, we can metal mineral particles in water by improving ICT structures and applications, and improving bio-efficiency[5].

By improving the overall structure of information and communication technology, water, electricity, fuel gas, coal, oil and various assets can be appropriately pre-allocated. Sensors implanted in key areas, regions, and urban communities improve monitoring of natural factors and classify key information for decision making. It is important to adhere to a clean and competent disposal of mineral waste in water. Measuring the waste transported by the population is therefore one of the difficulties associated with the idea of an ideal location. [12] [1]

Zinc (Zn)

Organisms require tracer scales for some metal ions such as "zinc (Zn), copper (Cu), and cobalt (Co)" as cofactors for enzymatic manipulation. In any case, the abundance of these mineral ions creates difficult problems for the body due to their high levels of damage, carcinogenicity, and bioaccumulation. [6] Due to its flexible function, zinc is one of the most well-known pollutants in surface and groundwater. Again, liquids containing zinc and strong dispersants are dangerous dispersants due to their biodegradability and heavy toxins. Overdosing on zinc can cause significant medical problems, such as stomach cramps, skin irritation, nausea, and iron deficiency. The World Health Organisation suggests a maximum satisfactory concentration of zinc ions in drinking water of 5. [1] [2]

*Copper (Cu)*Copper (Cu), like zinc, is an integral part of living organisms, including humans, and, in limited quantities, is essential in our diets for staying healthy. [12] In both cases, the consumption of excess copper causes real toxicity problems such as vomiting, stomach cramps, illness and syncope. The World Health Organisation proposes a maximum adequate copper ion concentration in drinking water of 1.5 mg L, whilst the US "Environmental Protection Agency sets 1". [7] [6]

IV. CONVENTIONAL METHODS FOR HEAVY METAL REMOVAL

Heavy metals such as "nickel, copper, zinc, cadmium, chromium, lead and mercury" release metal-polluting wastewater in many companies and are important toxins for new storage

facilities. Due to their hardworking, non-degradable and harmful nature, they accumulate in the soil, for example in a developing way of life, and cause real problems of well-being. [11]

Many conventional treatments have been used over the past 20 years to remove heavy metals from contaminated wastewater. The conventional methods include chemical precipitation, ultrafiltration, ion exchange, rotational osmosis, electrolytic winches, herbal medicine, etc. [4] [5] [2]

Chemical precipitation

Chemical precipitation is one of the most commonly used method for separating/removing heavy metals from inorganic wastewater. The calculation tools included include "metal hydroxides, sulfides, carbonates and phosphates" (highly insoluble particles), the dissolved metal ions of which are accelerated by chemical reagents (precipitants) and can be separated mainly by precipitation or filtration. [1] [5]

Ion exchange

The ion exchange is based on the reverse ion exchange between the strong and the liquid phase. Ion exchangers are strong rubbers which are suitable for exchanging cations and anions in the electrolyte and which provide a counterion with a similar charge with a chemically proportional sum. [6] [7]

Adsorbent	Containment	Adsorbent Dose	% Removal
Xanthated DP Trunk	Pb2+	5	99.4
Raw Date Pits	Cu2+	0.5	90
	Cr6+	5	98.7
DP Fiber	Pb2+	0.5	88
Palm Fiber & Petiole	Cd2+	0.5	65.7
Raw date pits	Pb2+	1	94
	Cr6+	1.2	99.95
DP leaves	Pb2+	0.5	99.72
Modified DP Trunk			
DP leaf ash			

Table1

V. ADVANCED DATA ANALYSIS WITH MACHINE LEARNING FOR WATER QUALITY ANALYSIS

The use of electronic information in the disposal and handling of electronic information has recently increased due to the use of sensor information. [6] [5] Various technologies

identified through the Internet of Things (IoT) are used to remotely detect and manage derived information.

Easily open and use open source programming dialects to quickly analyse information using high-tech information processing techniques such as machine learning. One of the routine methods of analysing information about water quality is direct regression. [3] [2]

The study examined the spatial distribution of water quality and broke the relationship between water quality and various restrictions. For example urban events or changes in soil properties.

The Krigagem method, which analyses spatial information, provides the best direct and impartial prediction for estimating the center of the river by interpolation and is widely used to estimate groundwater quality. [8] [9] Values of the chloride concentration and the sodium absorption rate in groundwater irrigation using the Krigagem method. [4] [5] “The locally weighted scatter smoothing (LOWESS)” is another information analysis method that analyses information using nonlinear relationships and reformulates a linear regression with normal extensions to give a smooth line fit to nonlinear information. LOWESS is widely used to estimate the concentration of airborne residues based on the emissions information collected on a truck. [6] [7] In either case, the direct regression method is not acceptable for related nonlinear problems such as non-specific source effects and self-cleaning in water systems. [3] [4]

VI. CONCLUSION

The purpose of ICT-based water quality management techniques is to effectively and continuously monitor water quality, predict future water quality standards, and respond quickly to adverse water resource events. The continuous development of advanced information that is revolutionising information analysis, such as: Deep Learning, enables an efficient analysis of large amounts of information over a certain period of time. Much of the information from in-situ field monitoring using innovative discoveries can be combined with modern information analysis techniques such as deep learning to more effectively control water quality.

Therefore, the continuous improvement of these cutting edge technologies for monitoring, sharing information and testing will improve water quality management. Despite the fact that the information collected is shared through new machine learning techniques, many water quality testing systems definitely make standard assumptions for the collection and monitoring of sample manuals. Therefore, in order to find the best solution for water quality management, it is essential to build a continuous monitoring system with sensor technology and implement it

together with advanced information analysis strategies such as deep learning.

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A Review on: *Carica Papaya* Used as Herbal Medicine in Primary Dysmenorrhoea.

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DOI: 10.29322/IJSRP.10.09.2020.p105106
<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p105106>

Abstract- Dysmenorrhea influences, women's daily chores, restriction in social or functional activities, it affects their attendance in school and colleges. Many of them try to indulge in home remedies and analgesics without prescription. Throughout the world herbal medicines are used as an alternative treatment which is rising rapidly and it is universally accepted. Primary dysmenorrhea releases the excessive amount of prostaglandin in the blood. *Carica papaya linn* plant is also called as Paw-paw, belonging to family Caricaceae. The fruits of *Carica papaya* help in contracting the uterus muscle, which eases the painful flow during the menstruation, in addition to that contains carotene, that help in regulating the hormone estrogen in the body, which causing regular period. Prostaglandin and menstrual pain can be reduced by Papaya leaf extract. The leaves of *Carica papaya* contain flavonoids which has anti-inflammatory activity. Flavonoid can inhibit the enzyme cyclooxygenase-I which is the first phase of pain mediation synthesis and prostaglandin that affect the decrease in the intensity of menstrual pain. Papaya leaves also contain Vitamin -E that act as suppressor to the enzyme activity of phospholipase A and cyclooxygenase post translational activation that reduce prostaglandin production. Vitamin E increases the production of prostacyclin and PGE2 which act as vasodilators that relaxes the uterine muscle. Hence, complete study of this paper is to review the effect of *Carica papaya linn* plant on menstrual pain and reduces the level of prostaglandin in primary dysmenorrhoea.

Keywords: Primary Dysmenorrhoea, *Carica papaya*, Prostaglandin, Vitamin -E, Flavonoid.

INTRODUCTION

Women is a wonderful creation of a god, who plays a tremendous role such as a mother, wife, daughter, home maker and daily wage earner. Menstruation is a natural phenomenon which occur throughout the reproductive years of females, but most of them suffer from certain level of pain during menstrual period, this is called menstrual disorder. Dysmenorrhoea is related with a pain associated with menstruation. This is the common problem in adolescent girls and in women of reproductive age, who are going through pain for 1-2 days of every month. Generally, women suffer from sweating, headache, nausea, vomiting, diarrhea during the menstrual period. Dysmenorrhoea causes mental problems, that leads females to be in solitude and limited their participation in different social or functional activities. Menstrual pain can be minimized by nonpharmacological therapies rather than

medicines. *Carica papaya* is commonly used as herbal medicine in menstrual pain which are affordable and alternative treatment. The various part of the papaya like seeds, fruits, leaves, leaves extract and latex exhibited medicinal properties that help to relieve menstrual pain. Papaya leaves contain flavonoids which perform anti-inflammatory activity that retard the action of the enzyme cyclooxygenase-I, which is the first phase of pain mediation synthesis such as prostaglandin, that decrease the intensity of pain in menstruation. The aim of this paper is to review and examine that *Carica papaya* is the herbal product that contains analgesic and anti-inflammatory activity which are essential in curing the menstrual pain and retain good health in women.

DYSMENORRHOEA

Dysmenorrhea derived from Greek word meaning is "difficult monthly flow." Dysmenorrhea is a term describing painful menstruation that involved cramps caused by uterine contraction. Women with dysmenorrhea have reduced sleep quality, quality of life, physical activity, mood swings in painful period. Diarrhea, vomiting, headache, dizziness, pain in abdomen and thighs. These are the common symptoms observed during or before menstruation start.

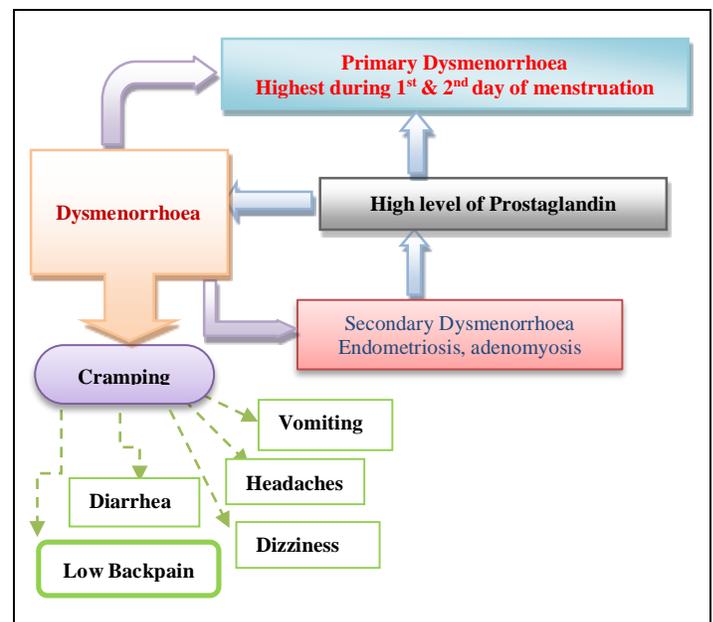


Fig. 1: Dysmenorrhoea and its types.

TYPES OF DYSMENORRHEA

Dysmenorrhea commonly categorized into two types:

- **Primary dysmenorrhoea**
- **Secondary dysmenorrhoea.**

PRIMARY DYSMENORRHOEA

Primary dysmenorrhoea is neither physical disorder nor due to presence of other diseases but it is recurrent. It is a spasmodic cramping pain in the lower abdomen, which occurs during menstruation. Pain usually begins 1 or 2 days before menstruation or when menstrual bleeding start. It is a cramping pain in the lower abdomen occurring during menstruation. The menstrual pain can be mild to severe and sustained for 12 to 72 hours. The symptoms such as sweating, headache, low backpain, diarrhea, vomiting, nausea usually appear just before or during the menstruation and persist during the first day or two or three days of menstruation.

3.PATHOPHYSIOLOGY OF PRIMARY DYSMENORRHOEA

A) Mechanism of Pain in Primary dysmenorrhoea.

The origin of pain in pelvis in Primary dysmenorrhoea due to the increased uterine production and released of prostaglandin level during menstrual period. Prostaglandin induces abnormal uterine activity which causes uterine ischemia and pain shown in Fig. 2. The increased in uterine activity and uterine ischemia are two important aspect in the generation of pain. In primary dysmenorrhoea, the uterine cramps and pain are associated with the release of prostaglandin in menstruation and the reduction of uterine flow with the increase of abnormal uterine activity.

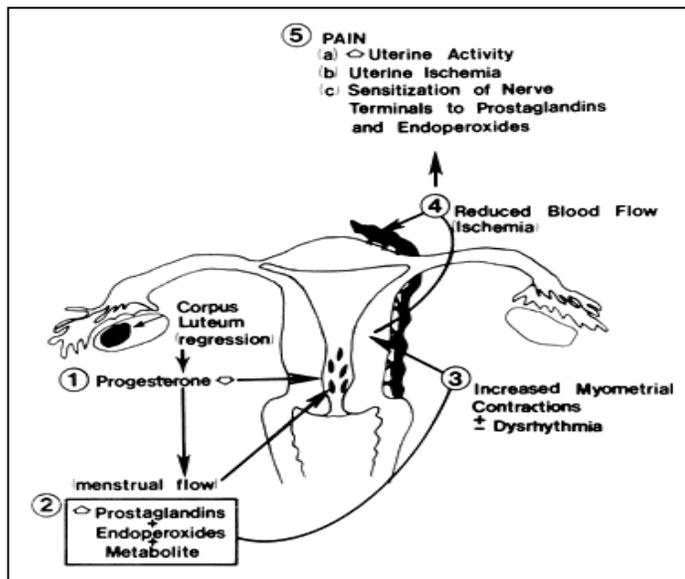


Fig. 2: Mechanism of Pain in Primary dysmenorrhoea.

B) Prostaglandin causes Primary Dysmenorrhoea

Primary dysmenorrhoea causes due to excessive level of prostaglandin hormone. Prostaglandin made in the lining of the uterus, that makes uterus contract during menstruation or child birth. A few days before the menstruation start, prostaglandin start accumulating in the endometrium cell,

which begin to break down during menstrual blood flow and release large amount of prostaglandin. Endometrium and myometrium can synthesize leukotrienes, in the 5-lipoxygenase pathway and that leukotrienes are involved in myometrial contractions. Endometrium and myometrium can synthesize leukotrienes, in the 5-lipoxygenase pathway and that leukotrienes are involved in myometrial contractions. In primary dysmenorrhoea, there are usually higher concentrations of menstrual leukotrienes, especially leukotriene C4 and leukotriene D4, without dysmenorrhoea in women. Because specific binding sites for leukotriene C4 are demonstrable in myometrial cells, it is likely that leukotrienes contribute to the uterine hypercontractility occur in primary dysmenorrhoea. The Release of prostaglandin constrict the blood vessels in the uterus and make the muscle layer contract, causing painful cramps. The biosynthesis of prostaglandins is summarized in Fig. 3. Prostaglandin Synthesized from arachidonic acid and eicosatrienoic acid, which are often derived from conversion of phospholipids A, triglycerides, and cholesterol esters by the enzyme acyl hydrolase. Prostaglandins are produced under the influence of cyclooxygenase (COX) isomerase and reductase which are collectively called as prostaglandin synthetase. These are involved in the biosynthesis of $\text{PGF}_{2\alpha}$ and PGE_2 . Availability of arachidonic acid, endometrial cellular trauma, and availability and inducibility of COX, are important factors that stimulate the generation prostaglandin production.

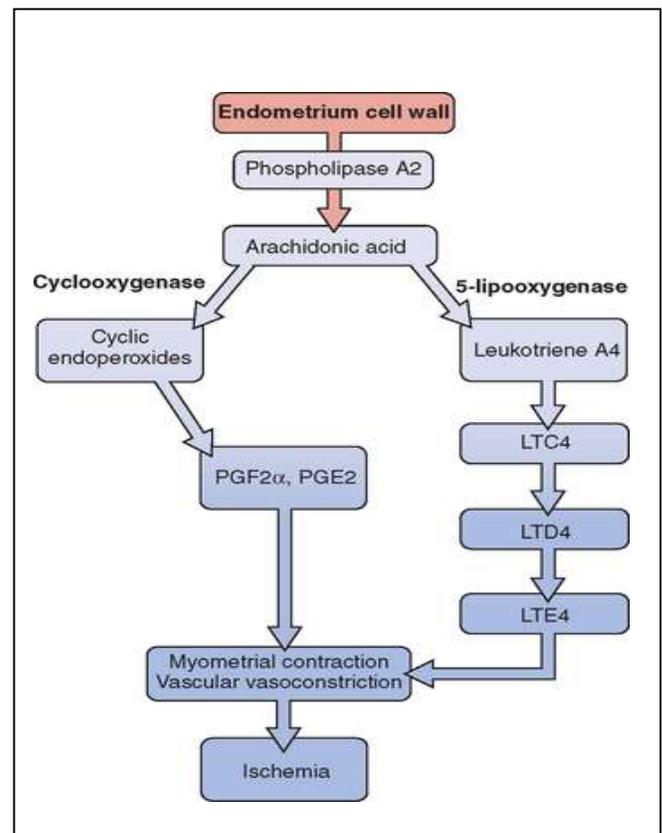


Fig. 3: Biosynthesis of Prostaglandin in Primary dysmenorrhoea.

SECONDARY DYSMONORRHEA

Secondary dysmenorrhoea is caused by a disorder in the reproductive system, pain that is caused by a disorder in the woman's reproductive organs, such as endometriosis, adenomyosis, uterine fibroids, or infection. The pain of secondary dysmenorrhoea often last longer than menstrual cramps. For instance, it may begin a few days before a menstrual period starts.

TREATMENT FOR PRIMARY DYSMENORRHEA

Those women who suffers from primary dysmenorrhea, are advised to first check through physician, that their period pain is not caused by certain reproductive disorders like endometriosis, uterine fibroids or by other diseases.

Treatment option for dysmenorrhoea, that may be –

- Pain killer or analgesic medication,
- Anti-inflammatory medication,
- Contraceptive pills,
- Rest during period, Regular exercise or
- **Herbal medicines to treat menstruation pain**

HERBAL MEDICINE USED TO TREAT PRIMARY DYSMENORRHEOA – *CARICA PAPAYA*

Herbal plants are used by most of the women to relive menstrual cramps or pain during monthly period, because use of these natural herbal medicines safe and have no side effects than the chemical drugs. Therefore, *Carica papaya* is alternative and most effective treatment of menstrual pain in women. The different parts of the *Carica papaya* plant including leaves, seeds, latex and fruit exhibited to have medicinal value.



Fig. 4: *Carica Papaya* plant

Carica papaya Linn is also known as Paw-Paw, belonging to family Caricaceae. It is Herbaceous and perennial plant.

Various part of *Carica papaya* contain active substances that can be used for therapeutic purposes or which are the precursors for the synthesis of useful drugs. The medicinal values of this plants due to containing chemical substances that produce definite physiological action on the human body.

A. CHEMICAL COMPOSITION OF *CARICA PAPAYA*

Every part of the *Carica papaya* containing essential chemical composition which are plays an important role to treat the various diseases. Each part of the papaya is an abundant source of enzymes, alkaloids, proteins, fibres, glycosides, vitamins which provide medicinal value to the papaya are summarised in a **Table I**.

Table I: Chemical Composition of *Carica papaya*.

Part of Plant	Chemical Component
SEEDS	papaya oil, carpaine, benzyl isothiocyanate, benzyl thiourea, β -sitosterol, carcin, enzyme myrosin, Fatty acid, crude fiber, crude protein
ROOTS	Caproside and enzyme myrosin
LEAVES	Alkaloids carpaine, pseudocarpaine, dehydrocarpaine 1,2, choline, caproside, vitamin C and E.
FRUITS	Protein, fat, carbohydrates, minerals, vitamins, volatile compound, alkaloids, glycosides
BARK	β -sitosterol, glucose, fructose, galactose, xylitol
JUICES	N-butyric, n-hexanoic and n-octanoic acid, lipid, myristic, palmitic, stearic, linolenic acid, oleic acid
LATEX	Proteolytic enzyme papain, chemo papain, glutamine cyclotransferase, chymopapain A, B, C, peptidase A and B, lysosome.

B. NUTRITIONAL VALUE OF *CARICA PAPAYA*

The Nutritional value of *Carica papaya* is rich in iron and calcium which is a good source of vitamins A, B and a vitamin C (ascorbic acid). It is the pack of Enzymes. It also contains terpenoids, alkaloids, flavonoids, carbohydrates, glycosides, saponins, and steroids, Enzyme Papain, chymopapain, Carotenoids B carotene, Cryptoxanthin, Monoterpenoids Linalool, 4-terpinol, Alkaloids Carpaine, Carpinine, Vitamin C and B, Glucosinolates Benzyl isothiocyanate, papaya oil, Flavonoids Myricetin, kaempferol, Alkaloids Carpaine, Carpinine. *Carica Papaya* is a powerhouse of nutrients are help to improve cardiovascular system, protect against heart diseases, heart attacks, strokes and prevent colon cancer.

C. MEDICINAL VALUES OF EACH PART OF THE CARICA PAPAYA

LEAVES

Young leaves of *Carica papaya* are abundant of flavonoids (kaempferol and myricetin), Vitamin E, alkaloids (carpaine, pseudocarpaine, dehydrocarpaine I and II), phenolic compounds (ferulic acid, caffeic acid, chlorogenic acid), the cyanogenetic compounds (benzylglucosinolate) found in leaves. *Carica papaya* also contain carotenoids namely β - carotene, lycopene, anthraquinones glycoside. These all exhibit the medicinal Properties like anti-inflammatory hypoglycemic, anti-fertility, abortifacient, hepatoprotective, wound healing. Its Leaves are used in acne medicine, increases appetite, ease menstrual pain, Meat tenderizer, Relieve nausea.

FRUITS

Carica Papaya fruit is a rich source of nutrients such as provitamin A carotenoids, vitamin C, B, lycopene, dietary minerals and dietary fibre. It is used to relieve gum disease, toothache and mouth ulcer. In the morning, by consumption of ripe papaya, we can cure indigestion, constipation, flatulence and appetite. The fruit helpful in contracting the uterus muscles, which eases the painful flow during that time of the month. Additionally, it is rich in carotene, helps in regulating the hormone estrogen in the body, thereby inducing regular periods.

SEEDS

Carica Papaya seeds contain antibacterial properties, are effective against E. coli, Salmonella and Staphylococcus infections. Papaya seeds help to protect the kidneys from toxin induced kidney failure. Seeds can eliminate intestinal parasites, and help to detoxify the liver, Cure piles, typhoid, anti-helminthic and anti-amoebic properties.

LATEX

Carica papaya latex contains enzymes papain and chymopapain, cysteine endopeptidases, chitinases and an inhibitor of serine protease. Unripe papaya latex contains papain, chymopapain is used to treat commercial beer, as a meat tenderizer, lower inflammation and improve healing from burns and in the production of chewing gums. Cosmetically it is used in Shampoos. In human's papain reduces blood pressure. It is also used in Anthelmintic, relives dyspepsia and cures diarrhea, pain of burns and topically use, bleeding hemorrhoids, stomachic, whooping cough.

ROOTS

Carica papaya roots is used in urinary troubles. A decoction of the roots of this tree in the cure of dyspepsia.

JUCICES

The milky juice is extracted from *Carica papaya* used as chewing gum for digestive problems, toothpaste and meat tenderizers. It contains papain and chymopapain used in digestive problems and in treatment of arthritis.

LEAVES EXTRACT

Carica papaya leaf extract containing Vitamin E which plays important activity in inhibition of cancer cell growth. It induces the production Th1-type cytokines. these cytokines help to control the immune system. Additional benefits of papaya leaves in menstrual pain.

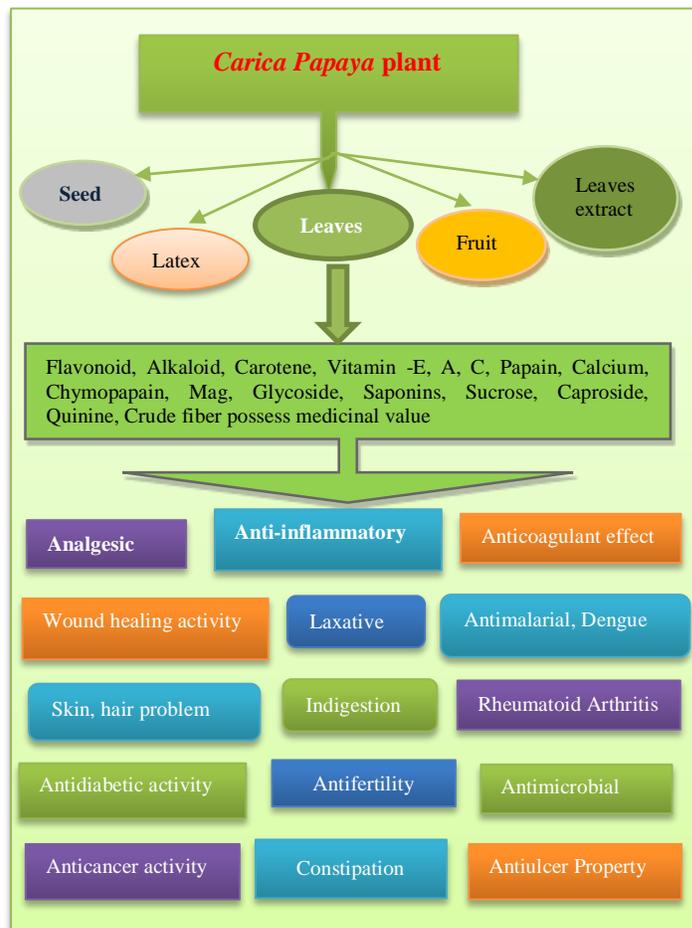


Fig. 5: *Carica papaya* plant exhibit medicinal value.

D) OTHER MEDICINAL VALUE OF CARICA PAPAYA

The different part of the *Carica papaya* plant containing leaves, seeds, latex and fruit exhibited medicinal, therapeutic values in many diseases.

1) Dengue fever

Carica Papaya leaf juice used in a dengue fever, which increases white blood cells and platelets, normalizes clotting.

2) Anti-malarial and Antiplasmodial Activity

Carica Papaya leaves tea are used in a treatment for malaria.

3) Rheumatoid Arthritis

Carica Papaya is a rich source of vitamin C which provide protection against rheumatoid arthritis.

4) Sunscreen and Soothing slave

Carica Papaya containing vitamin A which helps to restore and rebuild damaged skin. papaya peel is used as skin lightening agent, which apply with honey, the skin becomes smooth and moisturize.

5) Laxative

Ripe fruit of *Carica papaya* is laxative which assures of regular bowel movement.

6) Indigestion

Carica Papaya plant contains an enzyme known as "papain", which are used in the preparation of different remedies for indigestion.

7) Wound Healing Activity

Carica papaya extract increases the wound healing property that is important component for treatment of wounds.

8) Anti-inflammatory Activity

Carica Papaya leaves contains various nutrients and plant compounds with anti-inflammatory property such as papain, flavonoids, and vitamin E. Papaya leaf preparation useful in internal and external inflammatory conditions, including skin rashes, muscle aches, and joint pain.

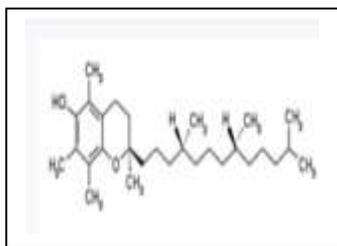
9) Antimicrobial Activity

Carica Papaya Plants shows antimicrobial activity because of the presence of bioactive compounds like glycosides, saponins, flavonoids and alkaloids.

MECHANISM ACTION OF CARICA PAPAYA IN DYSMENORRHEA

VITAMIN E

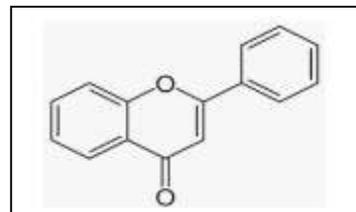
Carica Papaya leaves is rich source of vitamin E which help to relieve menstrual pain by inhibition of prostaglandin biosynthesis. Vitamin E inhibit post-translational activation which reduce prostaglandin production. Vitamin E increases the production of vasodilator prostacyclin, prostaglandin E2 (PGE2), phospholipase A2 and arachidonic acid release, but suppress the COX post translational activity. In brief, vitamin E and its analogues inhibit phospholipase A2 and COX activities to inhibit prostaglandin production but promote vasodilator and uterine muscle relaxing prostanoids such as prostacyclin.



Vitamin E

FLAVONOIDS

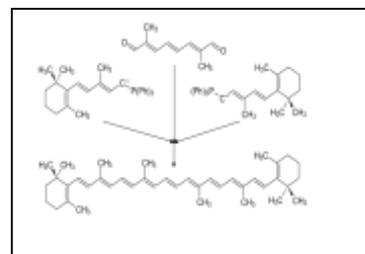
Flavonoids are important constituent present abundant in *Carica papaya* leaves having anti-inflammatory activity that can inhibit the enzyme cyclooxygenase-I that affect the intensity of menstrual pain. Flavonoids act as antioxidant agent. It helps to control the cellular activity and fight off free radicals that causes oxidative stress in body. Flavonoid block the enzyme cyclooxygenase I, that is the first phase of pain mediation synthesis such as prostaglandin that affects the decrease in the intensity of menstrual pain. Flavonoid blocks cyclooxygenase I (COX I) which has a role in prostaglandin biosynthesis as pain formation mediator, so that it will blocks the pain occur in menstruation.



Flavonoid

CAROTENE

present in the part of the fruit of the plant. Carotene helps in regulating the hormone estrogen in the body, thereby inducing regular periods. The fruit helpful in contracting the uterus muscles, which eases the painful flow during that time of the month.



Carotene

PAPAIN AND CHYMOPAPAIN

Papain and chymopapain present in the leaves of the *Carica papaya* has analgesic activity.

CALCIUM AND VITAMIN- C

papaya leaves contain Calcium and Vitamin -C which can affect contractility and relax the uterine smooth muscles to the enzyme activity of phospholipase-A and cyclooxygenase by inhibiting of cyclooxygenase.

MAGNESIUM

Papaya fruit contain magnesium which has a direct effect on blood vessel pressure and regulates the entry of calcium into smooth muscle cells, so it affects contractility, tension and relaxation of smooth muscle of the uterus.

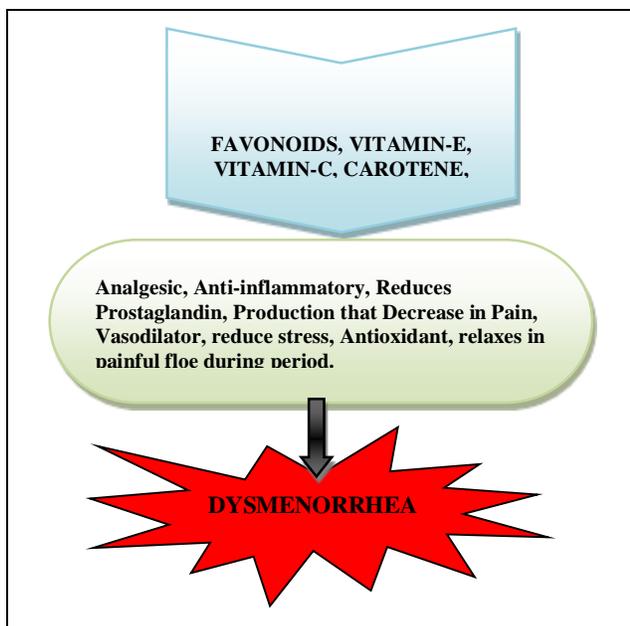


Fig. 6: *Carica papaya* in Dysmenorrhea.

FUTURE ASPECT OF *CARICA PAPAYA*

Traditionally, *Carica papaya* has been used for human betterment for a very long time. The part of the *Carica papaya* containing Leaves, Leaves extract, fruit, seeds and latex etc. are rich in a wide variety of Nutritional, Medicinal and Pharmacological values present in varying concentrations that makes-up the utility. These parts of plant possess antioxidant, chemoprotective, analgesic, anti-inflammatory and anti-infective properties that link to numerous human biological functions and allows to maintain the well-being of women body and retrieve of many disorders.

- *Carica papaya* is a naturally available, effective and safe product with rich sources of vitamins which provide pharmacological improvement/development in human and animals.
- It is proved that Papaya possesses nutritional as well as medicinal properties and its consumption and utilisation is beneficial to boost immunity against various diseases.
- Globally, there is an increase in demand of cosmetics, cosmetic industry use of *Carica papaya* in formulation of cosmetics. Because papaya is rich in Vitamin A, B and C, Minerals, Amino acids, fruit enzymes and Antioxidant. Papaya is used as a tonic in shampoo and conditioner also in facial moisturizer products for its anti-aging properties and it can be used to exfoliate and brighten skin.
- Papaya is abundant source of antioxidants, minerals that can be used in both moisturizing and boosting elasticity in skin and hair.
- In the future, *Carica Papaya* has been used to treat the Abortifacient, Amebicide, Asthma and respiration, Cancer, Corns and Bile, Dengue fever, Digestive purpose,

Dyspepsia, Wound healing, Anticoagulant and Rheumatoid arthritis due to presence of flavonoids, alkaloids, glycosides, vitamins A, B, C and various enzymes.

- It Enhance body's immunity; Papaya leaves contain phenolic compounds, papain and alkaloids. These nutrients act as strong antioxidants which, enhances the body's immunity.
- *Carica papaya* contains an enzyme known as papain which is helpful to improve Digestive function and used for indigestion and promote the lung health as a natural medicine.
- Many research's has found that, by consuming *Carica papaya* at least once per week, might reduce the chance of getting a persistent HPV infection as compared to those never eating papaya fruit.
- In future *Carica Papaya* can be used to treat a sexually transmitted infection that can lead to genital warts or cancer (human papillomavirus or HPV). *Carica papaya* has a Antifertility property which may use to reduce fertility problems.



Fig. 7: various wide range of pharmaceutical product of *Carica papaya* available in market

It is observed in Fig. 7, there are various types of pharmaceutical products are including tablets, syrups, powders, face wash, ointments, shampoo and other dosage form containing *Carica Papaya* available in market at wide range and various researcher work on *Carica papaya* and its various parts which containing rich source of potential active substances useful for health and boost immunity of body in various diseases.

CONCLUSION

The ongoing review is about Menstrual pain that can be overcome by using natural herbal plant that is papaya (*Carica papaya linn*). The general mechanism of the different parts of *Carica papaya* including Leaves, Extract, Fruit, Seeds and Latex which cure the menstrual pain by inhibiting prostaglandin level and cyclooxygenase (cox-2). It also helps in contracting the uterus muscles, which eases the painful flow during that time of the month. It can be used as a safe and effective herbal medicine for primary dysmenorrhoea therefore it is advisable to adolescent females to consume *Carica Papaya* in painful days. The medicinal qualities and values of *Carica Papaya* can be enriched for medicinal purpose by investing wealth and time to draw out its value in future.

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The Effectiveness of Municipal Solid Waste Management and the State Duty of Care

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DOI: 10.29322/IJSRP.10.09.2020.p105107

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p105107>

Abstract- In 2007 Sri Lankan government introduced the National Policy of solid waste management and allocated LKR 5.7 billion in 2007 and LKR 44.24 billion in 2017 but the major waste management practice adopted by the Western Province even by the year 2020 is dumping to sanitary landfill without resource recovery. This practice contradicts to the 4-R principles advocated by the National Policy.

Accordingly, in the present study, research questions made were whether current solid waste management practices in the Western Province are effective or not in terms of the 4-R principles as perceived by respondents, if current solid waste management practices are not effective – why they are not effective, and what strategies make the solid waste management in the Western Province more effective?

The research was designed to build a theory with qualitative methodology to explore the answers to research. Preliminary data were organized as open coding according to their properties and dimension and then recoded as axial coding. Then the validity of axial coding was confirmed using the Pearson correlation coefficient before embedded them to the theoretical paradigm. Then these confirmed axial codes were integrated into a core category viz. selective coding to refine the theory to explain current effectiveness of solid waste management in the Western Province. Results confirmed that the solid waste management practices in the Western Province are not effective. The effectiveness is correlated to the awareness of authorities ($r = 0.924$), the awareness of citizens ($r = 0.879$), the facility development by local authorities ($r = 0.910$) and to the strength of legal framework ($r = 0.564$).

The model developed explains that the current ineffectiveness of solid waste management in the Western Province is due to the negative state duty of care, the insufficient negative awareness of the citizens and top-down approach of the execution. The model unveils the mafia as a hidden factor that affect the waste management. The research recognized that the increase of awareness of citizens and adopting the bottom-up approach as the solutions to increase the effectiveness of solid waste management and recommends creating community based participatory development projects for solid waste management.

This social theory and the recommendations are applicable to other provinces of Sri Lanka as well as to all ex-colonial countries where the corruption perception index is high as highlighted by the Literature Review.

Index Terms- Effectiveness of Solid Waste Management, the Western Province of Sri Lanka, National Policy of SWM, 4-R

principles, Awareness, State Duty of Care, Legal Framework, Mafia

I. INTRODUCTION

Solid Waste Management (SWM) is defined as the discipline associated with regulating of waste generation, storage, collection, processing and dumping of waste in a way that best addresses the public health, preservation, economics, aesthetic, manufacturing and ecological concerns (Leblanc 2015).

The problem is justified by existence of abusive backyard and roadside dumping that have contributed to the increment of the Dengue epidemic to the highest level in the WP. More than 50% Dengue patients reported from entire Sri Lanka has been reported from the WP for the past decade.

Following research questions have been formulated based on the statement of the problem narrated in Section 1.2.1 above:

- i. Are the current SWM practices in the WP effective or not in terms of 4-R principles and have the correct final disposal means been established by the National Policy of SWM?
- ii. Why are the current SWM practices in the WP not effective in terms of the outcome theoretical coding/variables selected?
- iii. What are the factors influencing the effectiveness of current SWM practices?
- iv. What are the strategies that should be taken to make the SWM in the WP more effective?

The present study which is designed to analyze the effectiveness of the SWM practices can be considered as an important study because the study investigates how citizens have perceived the effects of execution of the National Policy of SWM along with the effects of the role of state officers legally bound to implement the National Policy of SWM. The study will also evaluate whether the actual solution that are in execution viz. transporting mixed or unsorted waste to Aruwakkalu dumpsite could increase the effectiveness of the SWM practices in the WP.

II. LITERATURE REVIEW

Charmaz (2006, p. 165) agrees with this idea that a novice Grounded Theorist should avoid observing facts through the lenses of other researchers. Notwithstanding this non-mandatory

requirement of the literature review until theoretical paradigm is built, the literature review is useful in theorizing especially in the process of building story line.

The progression of humankind from the primitive civility to advanced civilities makes the general consumption -a rapid growing phenomenon, not only in volumetric portent but also concerning variation of product range. Parallel to the industrial revolution during the late 18th century, this phenomenon, the mass consumerism started to increase exponentially. Thus, to regulate the remaining after human consumption, a new discipline – the SWM was born (Strasser 2015).

In fact, human beings in the past 50 years have exterminated more resources than they have consumed during the entire human history of millions of years (United States EPA 2009, p.5). This finding agrees with the finding of Strasser that the modern SWM issues have a history no more than one and half century. Exaggerated consumption means a creation on new problem over remaining of consumed resources generally termed as waste. This waste issue is aggravated further adding remaining waste of the extraction, production and distribution channels. This explanation is in line with the consumer sequence which is the connexion among extraction, production, distribution, consumption, and disposal (Fellow 2000). Since this relationship has a linear relationship, it should be respectfully disagreed with the denomination by Fellow that above chain as the consumer cycle. In fact, Paletta (2019) describe more correctly that the present global consumer behaviour is take-make-dispose which is a linear relationship.

Narrowing the discussion from global sustainable development goals to goals fixed in Sri Lanka in 2007, the National Policy of SWM (2007) states that the waste generation in country is 6400 MT/day and just 42% is being collected by the 325 local authorities. The source clarifies indirectly that the non-collected portion of waste is visible as roadside dumping in the WP. This situation shows that sustainable development goals of UN fixed 28 years ago are far from Sri Lankan context even by the year 2020.

Narrowing the discussion to waste generation of the Western Province (WP), the WP alone produces 3500 MT/day (WMA-WP 2014). The WP consists of 49 local authorities. The main waste generator in the WP is the Colombo Municipal Council (CMC). It produces 800 MT/day or 23% of total waste generated within the province.

Policy statements 5, 5.11 and 5.21 of the National Policy of SWM admit respectively the need of building infrastructure facilities for SWM, increase of awareness and strengthening the existing legal framework at all ranks. These ranks intended by the section 5.21 of the national policy of SWM can be interpreted as citizens and authorities.

Further, the policy principle 4.1 of the National Policy of SWM states that SWM will manage according to 4-R principles and final disposal of residuals will be done applying suitable cure before the dumping (NPoSWM 2007). Therefore, evaluating criteria of the effectiveness of SWM has been selected as 4-R principles namely reduce, reuse, recycle and recovery with the criterion final disposal.

As regarded in the discussion about the awareness of authorities, the duty of reduction of consumption is a sustainable obligation of all levels of citizens and corporate citizens. Many

researchers have found that citizens are readily prepared to discharge their environmental duties (Stofejova 2020). Basnayake et al (2020) citing CEA (2016) express their view that in Sri Lankan context authorities have implemented awareness programs through mass media addressing the sustainable development in order to increase the awareness of the citizens. In the WP context, a study conducted within the Dehiwala Mount-Lavinia Municipal Council area suggests that people are prepared to pay for the waste generated by them (Welivita 2014). Findings of these environmental responsibility show that citizens have a good level of awareness about SWM. But any of above studies do not indicate how this increment of awareness could be measured or evaluate. Therefore, these researches have not significant academic value and leave readers to presume that there is no significant increment in awareness of citizens.

It is the commonly understood that the meaning of establishing facilities and infrastructures for SWM as establishing facilities for final disposal of waste. However, facility development for SWM include provide facilities for the collection, storage, transportation, recovery, treatment and final disposal of waste (Herath 2013). These include collecting vehicle with or without compactor facilities and with or without separated space for different types of waste, sorting facilities and different types of final removal facilities viz. incineration, composting, raw dumping or sanitary land filling.

Basnayake et al. (2010) define that the legal framework concerning the SWM consists five major components viz. the constitution, National Environmental and Pradeshiya Sabha Acts, Municipal Council Ordinance, Provincial Statutes, regulation and guidelines and by-laws of the local authorities. This is an inaccurate definition since legal framework of the subject matter has a very wide meaning. To re-correct what Basnayake et al have expressed as the legal framework, they are quoting nothing other than some source of laws in Sri Lanka.

According to Transparency International Sri Lanka, the Corruption Perception Index (CPI) of Sri Lanka is 93/180 (Transparency International 2020). To understand CPI, the rank of 93 of Sri Lanka has to compare with the rank 1 of a clean country like Sweden out of 180 countries selected. The rank of 93 has been attributed to Sri Lanka because the law enforcing authorities such as Police, environmental agencies and court system are highly corruptible. Therefore, the effectiveness of SWM practices in the WP should be interpreted in light of the Corruption Perception Index. The Commission to Investigate Allegations of Bribery or Corruption (CIABOC) officially admits the validity of the observation of the Transparency International (CIABOC 2018, p. 5).

III. METHODOLOGY

The qualitative approach followed by the Grounded Theory (GT) strategy (Glaser and Strauss, 1968). GT strategy follows the interpretivism philosophy. The adaptation of the GT strategy as the research strategy was justified since behavioural patterns of citizens as waste generators and behavioural patterns of state officers as executors of SWM are lying in the social arena. The epistemology of this philosophy stands on the base of the investigation whether the current Solid Waste Management

(SWM) practices in the Western Province (WP) are effective or not and if not effective, why they are not effective.

The sampling technique adopted in this research was purposive judgemental sampling technique. In the GT strategy, there is no importance about the size of the sample. Instead, it counts the data densities of coded concepts that are the basic building blocks of theorizing process. The sample size in the GT strategy may be very small because Grounded Theorists are keeping sampling until categories or concepts are saturated with data densities. This logic should be well distinguished and contrasted from general sample size theories adopted in quantitative approaches (Glaser, 1992, 1998, 2001; Stem, 2001 as cited in Charmaz 2002, p. 114). This theoretical saturation notion is not possible to compare with the proportional sampling size determined in the quantitative approach.

The type of data selected for this part of study was semi-structured deep interviews. Interviews were semi-structured to facilitate interviewees to remain focussed on the subject matter SWM. A total of 26 semi-structured deep interviews were conducted expressly - a total of 7 deep-interviews at Moratuwa Municipal Council area, a total of 8 deep-interviews at Maharagama Urban Council area and a total of 11 deep-interviews at Homagama Pradeshiya Sabah area.

The first step of coding in GT strategy is known as open coding. It is the initial analytical process used in this research. Data were fractured and some concepts were identified according to properties and dimensions of concepts. The initial step of the coding process is open coding. It is the process in which basic concepts are being identified through properties and dimensions discovered in data.

At the end of this process some conceptual building categories were identified. The next step is clustering these mutually relevant concepts into major-groups according to their patterns. This process was helpful to reduce a huge amount of data into manageable links technically known as Axial Coding.

The Pearson correlation coefficient is one of the best statistical measures to calculate correlations between items in similarity metrics (Kent State University 2019). The quarry option: cluster analysis that had incorporated into the data management software NVivo® facilitated to conduct correlation calculations between two or more concepts.

The Pearson correlation coefficient between two concepts exemplified as x and y is denoted as r or r_{xy} can be computed as:

$$r_{xy} = \frac{cov(x, y)}{\sqrt{var(x)} \cdot \sqrt{var(y)}}$$

where $cov(x, y)$ is the sample covariance of x and y ; $var(x)$ is the sample variance of x ; and $var(y)$ is the sample variance of y . In this research the symbol x was represented by the cause concepts. They were axial coding; awareness of local authorities, and awareness of citizens, facility development by local authorities, facility development by citizens and the strength of the existing legal framework. The symbol y in the formula was referred as the outcome concept - the effectiveness of the SWM in the WP.

The sign r_{xy} indicates the direction of the relationship between the outcome concept - the effectiveness of SWM and cause concepts. It ranges between the -1 and the +1. The value -1 indicates a perfect negative relationship and the value +1 indicate that there is perfect positive relationship between concepts under

investigation. Likewise, the value 0 indicates that there is no relationship between concepts. Therefore, the magnitude of the correlation (how it closes to -1 or +1) is the measurement that considered as the strength of the relationship. Statistically, correlations values less than 0.5 are considered as weak correlations, between 0.5 and 0.8 are considered as medium or moderate correlations and correlations greater than 0.8 are considered as strong correlation.

The selective coding process is described as the process of integrating and refining the theory (Strauss & Corbin 1998, p.143). Integration is mixing data with the concept that has combined axially along with the meaning of concepts. In this process, the investigator may draw reasoning lines interpreting what the participants intended to say or what they have forgotten to say about SWM practices in their respective local authority area.

IV. RESULTS

It should be appropriate to re-produce the definition of open coding given by Strauss and Corbin as 'the analytical process through which concepts are identified and their properties and dimensions are discovered in data'. The principle open codes were created isolating central concepts and their properties of these central concepts, their dimensions and evidence by participants' words.

Strauss and Corbin have defined the axial coding as the process of relating categories to their subcategories. The reference densities of open coding were considered in construction of axial coding. This had been done by re-grouping of open codes by their common properties and dimensions.

Accordingly there were 455 or 70.22% coding references in the axial node - the SWM in the WP is ineffective. However, there are moderate number of coding references, viz. 193 or 29.78% coding references in the node - the SWM in the WP is effective.

At this point correlation between outcome and cause concepts could be measured.

Pearson Correlation between the Effectiveness of SWM Practices in the WP and the awareness of local authorities was 0.924. It was a very strong positive correlation. This result confirmed that the effectiveness of SWM practices in the WP is highly correlated to the awareness of local authorities.

Pearson Correlation between the effectiveness of SWM practices in the WP and the awareness of citizens was 0.879. It was a very strong positive correlation. This result confirmed that the effectiveness of SWM practices in the WP is highly correlated to the awareness of citizens.

Pearson Correlation between the effectiveness of SWM practices in the WP and the facility development by local authorities was 0.910. It was a very strong positive correlation. This result confirmed that the effectiveness of SWM practices in the WP is highly correlated to the facility development by local authorities.

Pearson Correlation between the effectiveness of SWM practices in the WP and the facility development by citizens was 0.562. It is a positive correlation. The results confirmed that the effectiveness of SWM practices in the WP is moderately depending on the facility development by citizen.

Pearson Correlation between the effectiveness of SWM practices in the WP and the strength of legal framework was 0.564.

It was a moderately strong positive correlation. This result confirmed that the effectiveness of SWM practices in the WP is moderately is correlated to the strength of the legal framework.

As discussed in the previous the theoretical saturation is the point in category development at which no properties, dimensions, or relationship emerges during the analysis. After the exploration of three major selective codes emerged viz. the state duty of care, awareness of citizens and the bottom-up approach as the solution, the project could claim the theoretical saturation because no additional concepts with considerable data densities were emerged from the data.

Strauss and Corbin (1998) explained that theorizing process is the process of giving a statement that systematically inter-related well-developed categories (p. 22). The present study has identified the three well-developed selective coding or factors that made SWM in the WP ineffective: as the lack of state duty of care, negative awareness of citizens and the top-down executor approach of the execution of the National Policy of SWM. This lack of state duty care and its wide social acceptance has led to make 4-R principles advocated by the National Policy of SWM null and void. This acceptance is the base of littering behaviour of citizens as well as the dumping behaviour without segregation by local authorities. On the other hand, this acceptance has facilitated racketeers their profit making practice at the expense of the national economy, damaging the environment, the public health and social order by collecting municipal solid waste and dumping waste without applying 4-R principles.

Effects of this state behaviour have copied by the citizens and vice versa. These effects have been embedded into the social fabric in the WP as well as Sri Lanka. This means a wide social acceptance has been received to sustain and to guarantee the durability of this lack of duty of care behaviour.

V. DISCUSSION

The first objective of the study was to examine whether current SWM practices in the WP are effective or not in terms of the principle 4.1 of the National Policy of SWM. Two axial coding that was created to achieve this objective in the qualitative Grounded Theory (GT) strategy: 'SWM is not effective' had 70.22% coding references density to confirm the ineffectiveness of SWM practices in the WP.

The second objective of the study was to examine why the current SWM practices in the WP are not effective. Findings have identified related issues such as, the negative awareness of authorities, the negative awareness of citizens, the lack of the facility development by local authorities and the weaknesses of the actual legal framework.

The third objective of the study was identifying issues relating to the current SWM practices in the WP. The theory generated through the model by the present research explains that the factors related to the effectiveness of current SWM practices are state duty of care, awareness of citizens and the implementation approach of SWM practices. In practical terms the lack of state duty of care, the negligence of citizens and the actual top-down implementation approach resulted as major issues determining the current ineffectiveness of SWM practices in the WP.

The Literature Review discussed the relationship of lack of state duty of care and mafia found by other researchers. In particularly, the study by D'Amato, Mazzanti & Nicoli (2015) have found that in local authorities where the mafia has penetrated, the effectiveness of SWM practices has been compromised. Additionally, through the history of Karadiyana dump site it was revealed how the state agencies were dominated by the mafia. Furthermore, the Literature Review brought evidence that the Corruption Perception Index (CPI) of Sri Lanka is very high as 93/180 citing the Transparency International (2020). This literatures confirms the lack of state duty and care as a individuate factor that increase the effectiveness of SWM practices.

The fourth objective of the study was to find out strategies that should be taken to make the SWM in the WP more effective. These strategies consist increasing the state duty of care to a satisfactory level, increasing the awareness of citizens and implementing SWM with bottom-up approach.

SWM is a vast social phenomenon that ingrained roots with every point of social, economic and political aspects of the society. Even though data in the present research was sufficient they were not adequate to represent the vast social phenomenon under investigation.

Charmaz expressed 'All is data' (2002, p.16). Higher the volume of data analysed, the internal and external consistency any research increases. To achieve internal and external consistencies in a practical way, all future researchers are strongly recommended to collect data of SWM through 'NCapture,' the feature of data management program used in this research NVivo®. This will enrich data by capturing data through videos, articles, online discussion groups and social platforms which was not allowed in this study.

Further, future grouped researchers are highly recommended to collect data from focussed groups, compare and contrast them in net-working as collective tasks.

VI. CONCLUSION

As per first objective of the study: in examining whether solid waste management practices in the Western Province of Sri Lanka is effective or not, the study confirmed that solid waste management practices are not effective.

In examining as to why the current solid waste management practices in the Western Province are not effective the study confirmed that the effectiveness of the solid waste management practices in the Western Province is significantly depending on the awareness of citizens and authorities, facility development by authorities and the strength of the legal framework.

The study has confirmed that issues relating to the current solid waste management practices in the Western Province are, insufficiency of: awareness of authorities, awareness of citizens, facility development by authorities and the weakness of legal framework. The study have introduced a model based on the social theory, which the effectiveness of solid waste management is depending on three components viz. state duty of care, awareness of people and the strategy of implementation of solid waste management.

The social theory built in the Grounded Theory strategy identifies strategies that should be taken to make the solid waste management in the Western Province more effective are

implementing strategies to increase the state duty of care, increase the awareness of the citizens and to change the present top-down approach.

As the model of the study suggests, the increase of awareness of citizens is the determinant factor that could increase due state duty of care and change the present irregularities in solid waste management approaches. If this happens, the same will be the end of waste mafia.

In conclusion, achieving an effective solid waste management through a sustainable development has revealed a myth rather than reality as understood by some researchers in Sri Lankan context (vide Atapattu 2002). The present study has demystified why sustainable waste management advocated by the National Policy of Solid Waste Management has not been achieved by bringing a novel knowledge identifying barriers to achieve an effective solid waste management through the model presented. This model opens the hidden door for the future researchers facilitating to develop the concepts further to achieve an effective solid waste management for the Western Province of Sri Lanka.

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Comparison Of Character Of Coco Fiber Material In Reducing Heat As A Potential Of Building Wall Insulation

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DOI: 10.29322/IJSRP.10.09.2020.p105108

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p105108>

Abstract- This paper was purposed to examine the comparison of the potential of coco fiber as a wall insulation of buildings in reducing heat based on the character. For the fulfillment of thermal comfort in buildings requires engineering, knowledge and skills and innovation. One way to reduce the hotter air inside the room can be done through the wall so as to reduce the use of air conditioning. The walls need protection and dampening of the sun's heat that can make the room inside the building has thermal comfort. Based on this, it is necessary to conduct research on natural materials that can function in reducing heat through the wall of the building. The test is done by comparing the material character. The material is coco fiber material with two types of thickness, namely 1 centimeter, and 2 centimeters. This coco fiber material is coated with a cement mixture which also functions as an adhesive the fiber. Other materials are a mixture of cement and sand which is usually used as a plaster wall. In this case the test by providing heat on one side of the fiber part and measuring the temperature that occurs on the other side of the fiber. The same heat test and treatment is also carried out on the material without a fiber. The results found that there is a significant difference between the temperature of heat that occur in various character of fiber with material without fiber. The fiber material a lower heat temperature based on thick fiber character than the material without a fiber. This indicates that coco fiber material has different potential as heat insulation based on character of fiber's thickness which can be used as material to coat the building walls of solar heat radiation.

Keywords: coco fiber, insulation, building wall, cement, reducing heat, character

I. INTRODUCTION

Sunlight is the main source of heat in the building, the heat of sunlight will mainly enter the room through the media of roof and wall. About 83% of the sun's heat in the form of infrared rays on the roof and building walls are absorbed and emitted into the room by radiation, conduction and convection. In humid tropical climates, the building coating is a building element that must be able to protect the occupants from the sun's heat, also reducing the radiant heat forwarded into the building. Therefore one of the functions of the building coating is to control or reduce the heat load from solar radiation into the building (transmission). The entry of solar radiation into the building can be through a vertical cover that is a wall or a horizontal or sloping cover that is roof. Cooling the space in this way is classified as passive cooling system that relies heavily on air movement as a hot carrier medium in the morning to late afternoon to reduce room's temperature (Cook) 1985 & (Giovani) 1994 (Santoso).

Global warming causes the warming of the earth's temperature so that the use of air conditioner in the room is also increasing as the need for comfortable room condition is also higher. This will increase the energy use of the earth and increase the contribution of rising earth temperatures and greenhouse effect. From the research of (Bourdeau) 1999 (Hari, 2016), also revealed the fact that 50% of the energy absorbed in a building is only consumed by refrigerators only, therefore 30% of the total energy required by a country is usually used in housing. This figure is from conditions in developed countries that are more manageable, for in developing countries this figure will not be smaller even believed otherwise. If this fact not handled strategically, there will be a terrible impact on sustainable nation development. Based on these factors, it needs to be balanced with the existence of building innovations that can save energy and environmentally friendly, as has been developed in several countries.

The heat on the wall will propagate into the room so the room becomes hot. Walls need protection and dampening from the sun's heat so that indoor space will not heat up. Therefore one way to inhibit heat from outside the room can be done through the wall. Non-heated rooms can reduce the use of air conditioning. By reducing the use of air conditioning means to save energy and also save the earth and the environment.

Environmental awareness can be realized with the use of materials derived from nature as a form of energy conservation and environmental protection. For example coco fiber, is one of the waste that has not been fully utilized in Indonesia. The amount of coco fiber capacity produced from coconut harvest annually in Indonesia is quite large where coco fiber is a large part of coconut fruit, which is 35% of the total weight of coconut.

Based on this matter, it is necessary to do research on natural materials that can reduce heat. The problem that arises in this study is how the potential of coco fiber material based on the character of thick fiber used as insulation to reduce heat. This research was conducted with the aim to know the potential of coco fiber which later can serve as a wall covering the building to reduce heat from outside.

II. REVIEW OF RELATED LITERATURE

Research on innovations related to environmentally friendly buildings to answer the phenomenon of global warming has been done by some researchers in research on building materials for walls that can reduce heat. Among them is Ayu Yuswita Sari et al, who conducted research on lightweight concrete panels focus on the perlite as a mixture of concrete panels that can serve as a heat insulator. Likewise Agus Santoso et al, who conducted research on mortal mix materials with a focus on the utilization of pumice breksia as the main ingredient of instant mortar as a heat reducer. While Hary Wibowo conducts a hot conductivity study between styrofoam and rice coir and focuses on measuring the comparison between styrofoam particle board composition with rice coir particle board composition as a good material for heat insulators.

Similarly, several studies conducted by foreign researchers on building materials for a wall capable of muffling the heat among them by Xi Meng et al., who conducted a study of the wall of the building that focused on the addition of retro-reflective material on the wall, which can improve the temperature of the building by reflecting solar radiation back in the opposite direction. Furthermore, V.B Omubo-Pepple et al., which conducted a study on building walls with a focus on determining the thermal conductivity of cement reinforced by periwinkle shells (sea shells) used as construction materials. Meanwhile, Dubois Samuel et al., conducted a study of building walls with a focus on hygrothermal behavior of plant-based insulation products to assess their impact on energy performance in buildings, predict indoor climatic conditions and prevent unexpected degradation risks.

III. RESEARCH ELABORATIONS

A. Material

The material in this study consisted of several characters for coco fiber material, namely 1 centimeter, and 2 centimeter coated with a cement mixture. The other materials are mixtures of cement and sand commonly used as wall plaster material. Process making material can be shown in Figure 1 below.



Figure 1: Process of making coco fiber material

B. Approach

The research approach tests related to coco fiber in reducing heat was following the framework in Figure 2.

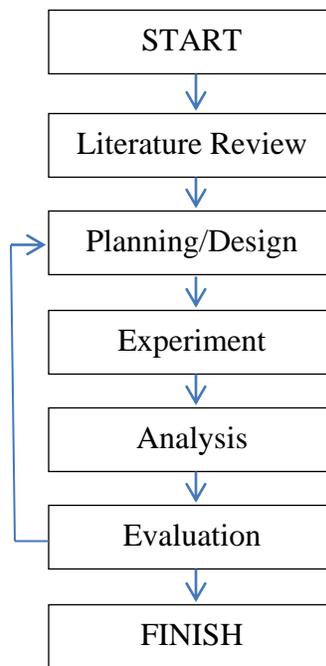


Figure 2. Flowchart of the Research Procees

The approach of this research is based on the experiment to know the potential thickness character of coco fiber in reducing heat. In this case testing is done by comparing the two test materials. After the fiber and cement is good enough to bind and harden then tested. In this case the test by providing heat on one side of the fiber part and measuring the temperature occurs on the other side of the fiber. The same heat test and treatment is also carried out on the material without a fiber. The heat given is 35 °C for 140 minutes. The instrument for measuring the temperature that occurs in the material is by using sensors connected to the computer and can be read on the monitor screen.

In testing, the material is placed in a box. Testing on this material is done by using 3 thermal sensors and one heater as a heater. The first sensor is placed on one side of the material connected to the heater as T1 which is the temperature given to the material. The second sensor is T2, which is ambient temperature in the test environment that is placed outside of the box. The third sensor, T3, is placed on the other side of the material which will detect the yield temperature that has been absorbed by the material. This heater is connected to a power source and a Ts controller which is a device to control the amount of temperature given.

IV. RESULTS OR FINDING

Research on innovations related to building materials that can reduce heat has been carried out by many researchers but not many have conducted research on the natural material of coco fiber. Coconut fruit composed of fibers that serve to protect the hard part called the shell, serves to protect the seeds that are only protected by the membrane attached to the inner side of the shell, there is a liquid containing many enzymes called coconut water, and solid phase settles on the wall of the shell along with the growing old fruit called coconut meat. It can be concluded that the coconut coir is part of the coconut that protects the inside of the coconut from the outside including from the heat of the sun. Based on this, coconut coir is estimated to have the potential for heat insulation so, it is necessary to research the character of coco fiber as building wall coating to reduce heat.

This study compared the potential character of thick coco fiber material to non-fiber material. The results test can be shown in the graph in the following figure. The figure shows that there are 3 graph lines: the top line shows the temperature given; the line in the middle shows the measured temperature after the material has been absorbed; the line below shows the temperature around the test.

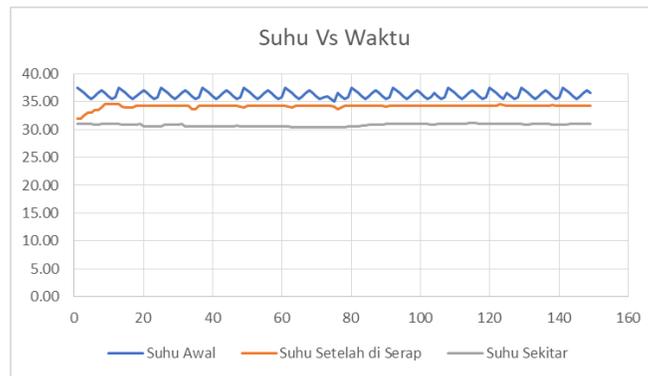


Figure 3: The results of material without fiber

The graph in Figure 2 shows the results test of material without fiber. The Y-axis of the series 1 line shows the amount of heat applied and measured on one side of the material expressed in Celsius, while series 2 shows the amount of heat absorbed by the material measured on the other side of the material, next the series 3 line shows the measured temperature in the environment around the test . The X-axis shows the length of time during the test expressed in minutes. The results obtained from the graph show that when given the heat of 35 Celsius for 140 minutes, the temperature measured on the other side of the material without fiber ranges from 34.5 °C.

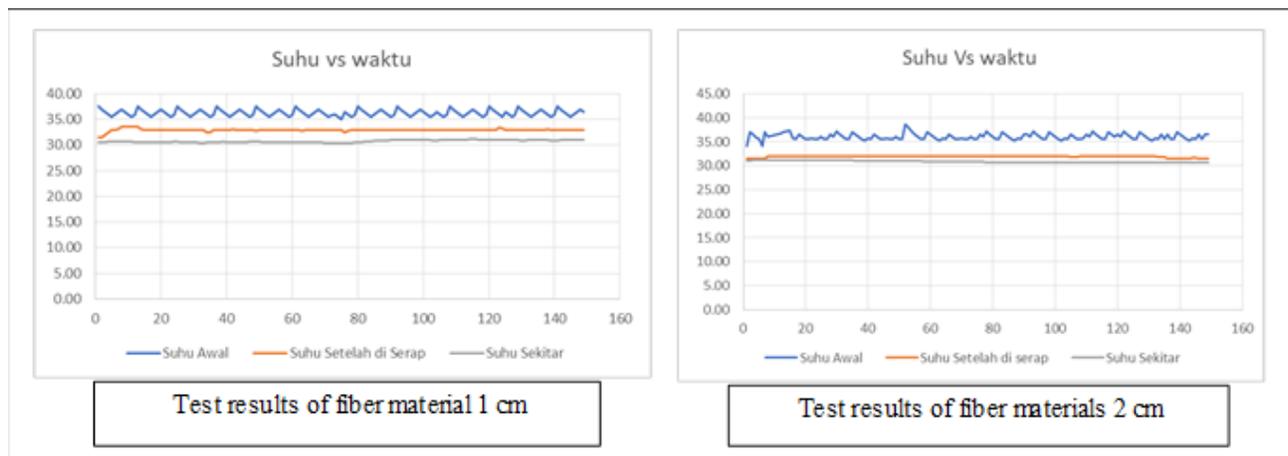


Figure 4: The results of coco fiber materials

The graph in figure 3 shows the test results of the fiber material with a thickness of 1 centimeter and 2 centimeters. The Y-axis of the series 1 line shows the amount of heat applied and measured on one side of the material expressed in Celsius, while series 2 shows the amount of heat absorbed by the material measured on the other side of the material, the series 3 line shows the measured temperature in the environment around the test . The X-axis shows the length of time during the test expressed in minutes. The results obtained from the graph of fiber material 1 centimeter show that when given the heat of 35 °C for 140 minutes the temperature measured on the other side of the material of fiber 1 centimeter ranges from 33 °C. The results obtained from the graph of fiber materials 2 centimeter show that when given the heat of 35 °C for 140 minutes the temperature measured on the other side of the material of fiber 2 centimeters ranges from 31.5 °C.

From the results of experiments conducted in this study showed a significant difference between the amount of temperature provided and the temperature measured between coco fiber and without fiber. From the comparison of thickness character of coco fiber material

shows that fiber material with a thickness of 2 cm is greater in reducing heat than the thickness of 1 cm. The results of this study may still be far from perfect because the test equipment used is still limited.

V. CONCLUSION

From the measured temperature comparison by coco fiber material, it can be concluded that fiber material with a thickness of 2 cm and 3 cm has the potential to reduce heat and has the potential as an insulating material for building wall coatings to reduce heat from outside. Based on the characteristics of types the coco fiber, the greater the heat that can be reduced.

ACKNOWLEDGMENT

I would like to express my gratitude to Prof. Selamat Triono and Mr. Rusnardi Rahmat, Ph.D., as my promoters and co-promoters. I would also like to thank those who have helped in this research. This research will be presented to those in need and to observers who are interested in energy-efficient buildings.

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Comparison of productivity of oil palm (*Elaeis guineensis* Jacq.) grown on tertiary sand and swampy area of Southern of Côte d'Ivoire

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DOI: 10.29322/IJSRP.10.09.2020.p105109

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p105109>

Abstract- Over the past several years, there has been a decrease in rainfall, resulting in an increase in the water deficit in the forest area of Côte d'Ivoire. It is with the aim of looking for new areas suitable for the cultivation of oil palm that experiments have been conducted on the hydromorphic soils of La Mé and low-bottom divo. The objective of this study is to compare the productivity of oil palm grown on tertiary sands and in marshy areas. The experiments were carried out on the CNRA stations in The South-East and Divo and on the Palmci production plantation in Divo, in the south-central area. The methodology is based on the time between initiation and maturation of diets. It takes 3 years between the initiation of the female inflorescence and the harvest of the diet. This evolution of inflorescence is influenced by rainfall and water deficit. The parameters measured were rainfall heights, water deficit, number of diets, average diet weight and performance. The results showed that the rainfall was higher at the Me compared to that recorded in Divo. During the four campaigns, yields were significantly higher on plantations on the hydromorphic soils of the Me and Divo lowlands than on those on the soils of the Me and Divo plateaus. The yield obtained during the 2005 season on the various plantations was 22,000 kg/ha/year in the hydromorphic zone of the Me, 20,500 kg/ha/year in the lowland zone of Divo, 13,000 kg/ha/year on the Mé plateau and 12,500 kg/ha/year on the Divo plateau. Therefore, the choice of hydromorphic zones is currently an interesting solution for improving and increasing the productivity of oil palm in Côte d'Ivoire.

Index Terms- Côte d'Ivoire, oil palm, plateau soils, swampy area, yield

I. INTRODUCTION

Today, Africa's population is estimated at more than 831 million, at 3.8 billion by 2100. These demographic changes are imposed by profound environmental changes, due to climate change, which in a region where extensive agriculture is dominant, have a negative impact on agricultural production [1, 2, 3]. In this context of food insecurity risks, it is essential to increase agricultural production in order to address development challenges and reduce the vulnerability of populations.

Like most developing countries, the Ivorian economy relies mainly on agriculture, in particular, on the exploitation of industrial crops (cacao, oil palm, coffee, rubber, etc.). Palm oil, with an estimated annual production of more than 400,000 tonnes, has been the second largest export after cocoa (1, 300,000 tonnes) since 2007. Côte d'Ivoire is the largest exporter of palm oil and the second largest producer of oil palm at African level [4]. These performances are the result of an important plantation creation programme, undertaken since 1961. This programme has combined the creation of industrial units (industrial plantations) of several thousand hectares with multiple village plantations.

Both types of exploitation developed in the southern Ivorian forest, on soils with whole natural fertility, and under appropriate rainfall conditions. These soils, such as ferralsols or tertiary sands, were covered with evergreen forests, playing an important role in maintaining fertility and mitigating climate change [5]. However, the transformation of tropical forests and the intensification of land use patterns result in soil erosion and substantial fertility losses [6]. In Côte d'Ivoire, vegetation cover has declined sharply since independence [7]. Indeed, the expansion of some perennial crops has contributed to the transformation of forests into plantations, the imbalance of natural ecosystems and the degradation of soils [8].

Land degradation remains a major concern due to its adverse impacts on agricultural production, food security and the environment [9]. Most soils in sub-Saharan Africa have low intrinsic fertility associated with increased nutrient loss [10]. As a result, the objective of agricultural increase is met with two constraints: the scarcity of land traditionally developed for oil palm and less favourable climatic conditions than in the past, namely the decline in Rainfall.

Oil palm production is linked to a number of factors: climate, soil fertility, seed genetic potential and farming techniques. Among these factors, water supply appears to be the most important factor of production. The optimal rainfall conditions for the oil palm are characterized by an annual total of up to 1800 mm of water, with a regular distribution [11]. Drier climate conditions can lead to very good yields when the lack of precipitation is offset by the presence of a shallow water table [12]. Rainfall has been reduced for several years, resulting in an increase in water deficit in the côte d'Ivoire forest area [13].

It was therefore important for the development of the oil palm to find new areas suitable for the cultivation of this oilseed, independent of the tertiary sands whose water tables are deep. Hydromorphic zones and shallows meet these criteria. In these areas, water is the main determinant of the environment and plant life. The water table is outcropping or close to the surface of the ground, or often the earth is covered by water. Hydromorphic zones and shallows are among the most productive environments in the world. They are the cradle of biological diversity and provide the water and primary productivity on which countless plant species depend for their survival. The full application of the development technique of these areas results in a gain of about 33% compared to the average productivity recorded on the tertiary sands [14]. The oil palm is, in particular, suitable for their development, because its fasciculated root system does not require a significant lowering of the tablecloth.

It is with a view to the search for new areas suitable for the cultivation of oil palm that experiments have been set up on the hydromorphic soils of La Mé and the low-bottom of Divo in Côte d'Ivoire. The objective of this study is to compare the productivity of oil palm grown on tertiary sands and in marshy areas.

II. MATERIAL AND METHODS

2.1 - Study area

The studies were conducted in the field in two different localities, namely La Mé in the Southeast and Divo in South-central of Côte d'Ivoire.

The experiments were carried out on four plots in the two localities. The tests were set up on a single type of plantation. These are industrial plantations, owned by Palmci, an Ivorian oil palm agro-industry and the National Centre for Agricultural Research (CNRA). The four test plots were:

- Palmci plantation in Divo (South-central of Côte d'Ivoire), installed on plateau soils, such as ferralsols;
- CNRA plantation in Divo (South-central of Côte d'Ivoire), installed on low-lying soils;
- CNRA plantation in La Mé (South-east of Côte d'Ivoire), installed on hydromorphic soils;
- CNRA plantation in La Mé (South-east of Côte d'Ivoire), installed on the tertiary sands, ferralsols type.

The climate of the South-east and South-central of Côte d'Ivoire is subtropically humid with marked seasons. The soils, derived from the tertiary sands, are ferralsols and hydromorphs, gravel and very little rich in organic matter, heavily desaturated, deep, sandy on the surface and without coarse elements. Kaolinite clay has a low ability to exchange cationically. These pedoclimatic conditions are favourable for the cultivation of oil palm.

2.2 - Plant material

The plant material is composed of oil palm hybrids obtained by cross-country between *Dura* (female) and *Pisifera* (male). The *Dura* type is characterized by fruits with a thin pulp and a thick shell. The *Pisifera* type is characterized by a high abortion rate of the fruit and a very thin or completely absent shell. The *Tenera* hybrid, called C1001F, from the "La Mé x Deli" cross-market, was used. This plant material, characterized by high yield and resistance to *Fusariosis*, is derived from the second cycle of reciprocal recurrent selection. This new plant material is currently

popularized in all Ivorian oil palm growing areas. For our study, only palm groves of 5, 6, 7, 8 and 9 years were selected.

In the oil palm, after the natural opening of the spathe of the female inflorescence, then the flowers occur which will be fertilized, no more than three days later, by the pollen grains of the neighbouring trees. The female inflorescence then turns into a diet, which will reach maturity 5.5 to 6 months after knotting. However, from the floral initiation to the maturity of the diet, it takes 30 to 33 months.

2.3 - Sample selection

When planting, a sample of about 5% of the trees is generally considered sufficient. To account for edaphic variations encountered on a culture unit, this sample must be distributed throughout the plot. As a result, one line out of 20 was systematically selected from which all trees were observed (for large areas). In total, these trees or lines were selected, and spread over the entire test plot. The same trees or lines have always been kept in order to be able to possibly adjust the results obtained, after several rounds of harvests, compared to the actual results obtained. The lines were marked with an identical marker on all study plantations, by metal tags bearing the line and tree numbers. This practice makes it possible to better organize diet weighings and to carry out systematic checks.

2.4 - Determining the rainfall and water deficit of the two localities

Rainfall data were recorded over 11 years, from rainfall, in the study locations to track its influence on oil palm production. Rain heights and total rainy day numbers were collected in the two localities studied (Divo and La Mé). These rainfall data were used to calculate annual water deficits (DH) from 1995 to 2005, using the simplified water balance method [15] which does not take into account runoff [16], due to the presence of cover plants.

The water balance (BH) is expressed from a very simplified formula, established in the climatic conditions of West Africa by the OHRI [17], which allows the calculation of the water deficit (DH) by taking stock of the rains, to which the soil water supply (estimated maximum reserve of 200 mm) is added.

$$BH - P - R - E, \text{ where}$$

BH: Water balance (mm);

P: Rainfall (mm);

R: Initial soil water reserve from one period to the next (limited to a maximum of 200 mm, due to the sandy texture of the soil) [17];
E: Simplified evaluation of adult oil palm evapotranspiration, which takes the value of 120 mm per month when the number of rainy days is greater than 10, and 150 mm per month, if this number is less than 10 [17].

The water balance was based on the difference between inputs (precipitation and initial soil reserve) and water loss (actual evapotranspiration) in the soil. When the water balance is negative, there is a water deficit (DH). The water deficit (DH) is expressed in the following formula:

$$DH = - BH$$

2.5 - Yield determination

On palmci's agro-industrial complexes and CNRA research stations (Divo and La Mé), the various productions were recorded for palm groves aged 5, 6, 7, 8 and 9 years. Four agricultural

campaigns collected production data, namely 2002, 2003, 2004 and 2005.

Yield components were determined from individual harvests. For this operation carried out every fortnight, a team including a harvester, a weigher and a pointing clerk visits each tree identified in the plot to collect the production data, according to each harvesting system, linked to the age of the palm grove. These include the bunches number per tree (NR/tree) and the bunches weight per tree (PR/tree), from which the average weight of bunches per tree (PMR/tree) and bunches tonnage or yields (TR/ha/year) were calculated. The bunches number per tree is determined by counting all bunches harvested on each useful tree. The bunches weight is determined by weighing, using a scale of all bunches harvested per tree.

The data collected is used to calculate performance using the following formula:

TR/ha/year = DP*NR/tree/year*PMR/tree/year, Where

DP is the actual planting density of which the standard is 143 trees/ha; NR/tree/year is the bunches number per tree per year and, PMR/tree/year the average weight per tree per year.

2.6 - Data processing and analysis

The data, collected and recorded using the Excel spreadsheet, was subjected to variance analysis using XLSTAT version 7.5 software. The level of significance of the differences between the averages was estimated using Duncan's test, at the threshold of 5%.

III. RESULTS

3.1 - Evolution of rainfall and water deficit in study locations

Rainfall data from all three communities show high interannual variability (Figure 1). Variations in rainfall at the La Mé and Divo stations are characterized by alternating wet years (high rainfall), moderately wet (near average) and dry (low rainfall). Over the 11 years of data, rainfall as a whole indicated a more decreasing trend in Divo than in La Mé. In general, these results have highlighted a downward trend in rainfall in the South-east and South-central of Côte d'Ivoire.

Annual rainfall in La Mé fluctuated from 1300 to 2000 mm of water over the observation period, with an average of 1700 mm

per year. It is a moderately watered area. The South-central is less so, with annual heights exceeding 1200 mm of water, either in Palmci, than at the CNRA in Divo. The rainfall of the forest area decreases as we move inland. In the locality of La Mé, the driest years were 2003 and 2004, with rainfall of about 1300 mm, while 2010 and 2011 were the wettest, with heights well exceeding 1900 mm of water per year.

The annual rainfall at CNRA-Divo varied during this period, from 991 to 1466 mm of water. The annual average recorded in this region was about 1240 mm of water per year. This community was poorly watered. The years 1995, 1999 and 2004 were the wettest, with average heights of more than 1400 mm of water per year. As for the Palmci de Divo site, the annual rainfall has fluctuated between 1008 and 1552 mm of water per year, with an annual average of 1250 mm of water. 1995 and 2005 were the wettest, with heights of 1552 and 1414 mm of water respectively. Divo region was markedly lower in average annual rainfall than La Mé. In general, rainfall in the South-east of the country remained largely very high than the South-central.

The evolution of the water deficit (DH) further explains the deterioration of the climate in the study regions. Over the 11 years, it is more than 200 mm of water each year. The annual water deficit (Figure 2) was higher in the South Central (Divo), with an average value of more than 400 mm of water than in the South-East (The Me), with an average value of 300 mm.

The DH obtained in La Mé varied from 230 to 453 mm of water. As for the Palmci and CNRA stations in Divo, the annual DH fluctuated from 201 to 701 mm and 237 to 668 mm of water, respectively. The information recorded in Divo and La Mé since 1995 shows that, overall, rainfall has been down, while dh has been up slightly.

From the point of view of rainfall and water deficit, the years 1995, 1999 and 2005 appear as the best respectively in Palmci in Divo, CNRA - Divo and La Mé. Values are 1552 mm versus 327 mm, 1523 mm versus 237 mm at CNRA - Divo and 1836 mm of water compared to 296 mm of water deficit for La Mé. The years of lowest rainfall are 1998 with 1245 mm in La Mé, 2002 mm at the CNRA in Divo and 2003 with 1008 mm of water in Palmci.

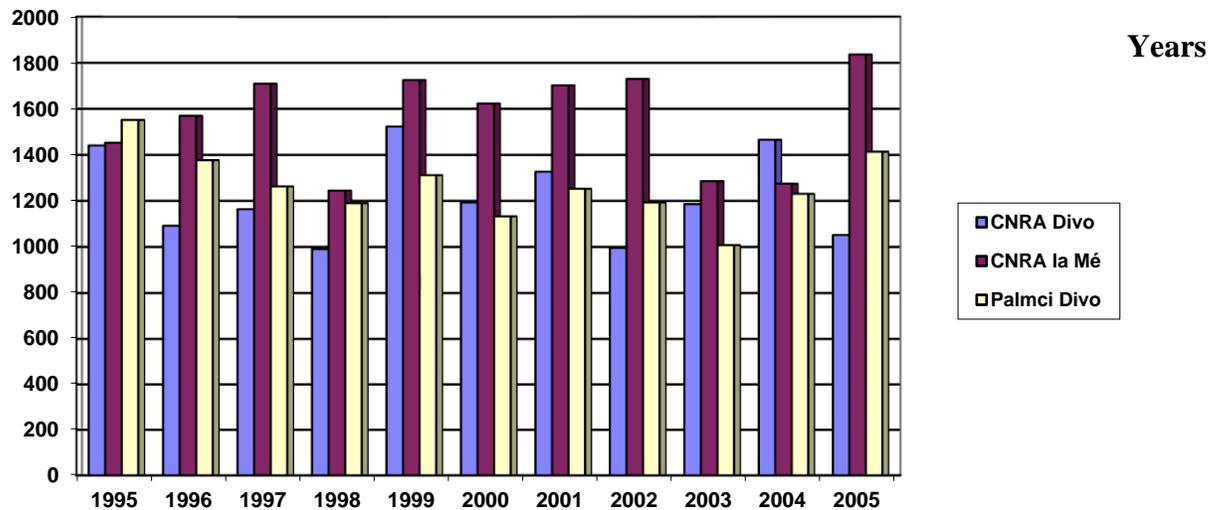


Figure 1. Evolution in annual rainfall on the three weather stations from 1995 to 2005

Table 1 Annual rainfall and water deficit data on the three weather stations from 1995 to 2005

Years		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Sites												
CNRA Divo	Rain	1441	1092	1164	991	1523	1193	1327	996	1186	1466	1052
	DH	334	587	563	668	237	459	396	606	444	401	612
CNRA La Mé	Rain	1453	1570	1709	1245	1725	1623	1702	1730	1286	1275	1836
	DH	246	319	426	459	230	447	313	231	291	310	296
PALMCI Divo	Rain	1552	1377	1263	1190	1312	1133	1253	1193	1008	1231	1414
	DH	327	444	564	538	303	554	391	532	701	586	202

3.2 - Evolution of yield in bunches on study plantations

The harvests were made 60 months (5 years) after planting, as under standard elaeiculture conditions so as to legitimize comparisons of oil palm production, of the same age and located in different environments. Production data were assessed through the number of bunches and the weight of bunches that calculate the average weight of bunch and yield per hectare.

3.2.1 - Number of bunches

The number of bunches (NR/tree/year) over the four campaigns was determined on the four plantations studied (Table 2). Analysis of variance reveals that there are differences between averages obtained on the four study plantations over the four campaigns.

During the 2002, 2003, 2004 and 2005 campaigns, the classification, according to Newman-Keuls test, resulted in two

distinct groups. The first group, with the highest averages, over the four campaigns, is represented by the averages obtained on the CNRA plantations of La Mé and Divo, installed respectively on hydromorphic and low-lying soils. The highest averages were recorded during the 2005 campaign, with values of 3400 bunches/ha/year on the hydromorphic soils of the Me and 3050 bunches/ha/year on the low-lying soils of Divo.

As for the second group, it consists of the averages obtained on the plantations of the CNRA of Mé, installed on tertiary sand and Palmci de Divo, set up on plateau soil, during the four campaigns. These averages ranged from 1150 (2002) to 1800 bunches/ha/year (2008) on the tertiary sands of the Me and from 950 (2002) to 1,750 bunches/ha/year (2005) on Divo plateau soils. In general, the number of diets harvested on all plantations has changed steadily from the 2002 to 2005 campaign.

Table 2: Summary of the total number of bunches produced on all study plots

Types of plantations	Number of bunches/ha/an			
	2002	2003	2004	2005
CNRA Lamé (Tertiary sand)	1150 b	1450 b	1650 b	1800 b
CNRA Lamé (hydromorphic soil)	2000 a	2350 a	3150 a	3400 a
CNRA Divo (Low lying soil)	1750 a	2250 ab	2400 a	3050 a
PALMCI Divo (Tertiary soil)	950 b	1350 b	1600 b	1750 b

The averages followed by the same letter are not significantly different at the 5% threshold.

3.2.2 - Average weight of bunches

The average weight of bunches on the four plantations was determined by the number of bunches and the weight of bunches over the four campaigns (Table 2). The variance analysis does not reveal any difference between the averages recorded on all plantations during the 2002 campaign. The average weight of bunch ranged from 5.1 (Divo plateau soils) to 7 kg (hydromorphic soils of La Mé).

For the other three campaigns, 2003, 2004 and 2005, there were differences between the averages recorded on all the plantations studied. The classification according to the Newman-Keuls test resulted in two homogeneous groups during these three

campaigns. The first group, with the highest values, consists of the averages obtained on hydromorphic soils of La Mé and low lying soil of Divo, and, during the three campaigns. These averages ranged from 8 (2003) to 12.8 kg (2005) and low-lying soils from 7.7 (2003) to 11.4 kg (2005).

On plantations on Divo plateau soils and tertiary sands of La Mé, the recorded averages constituted the second homogeneous group. In the three campaigns, averages were lowest, with values ranging from 6.8 (2003) to 10 kg (2005) on the tertiary sands of La Mé and from 5.5 (2003) to 9.2 kg (2005) on the Divo plateau soils.

Table 3: Summary of average weight of bunch produced on all study plots

Types of plantations	Average weight of bunch (kg)			
	2002	2003	2004	2005
CNRA Lamé (Tertiary sand)	5,9 a	6,8 b	8 b	10,0 b
CNRA Lamé (hydromorphic soil)	7 a	8 a	9,8 a	12,8 a
CNRA Divo (Low-lying soil)	6,7 a	7,7 a	9,7 a	11,4 a
PALMCI Divo (Plateau soils)	5,1 a	5,5 b	7,1 b	9,2 b

The averages followed by the same letter are not significantly different at the 5% threshold.

3.2.3 - Total of bunches weight or yield

Yields per hectare expressed in kg of bunches per hectare (kg/ha), obtained over the four years of observation, show the high productivity of the swampy areas of Divo and La Mé compared to the tertiary sands on Divo and La Mé plateau.

The variance analysis applied to cumulative production of the three campaigns (2003, 2004, 2005) shows a significant difference between the averages recorded on the four plots studied (Table 4). The classification according to the Newman-Keuls test resulted in two distinct groups. The first group consists of averages recorded on the plantations of the marshy areas of La Mé and Divo, which produced the highest yields. These averages have varied, on the planting of hydromorphic soil of La Mé, from 14,500 (2003) to 22,000 kg/ha/year (2005) and on low-lying soils of Divo, from 13,000 (2003) to 20,500 kg/ha/year (2005).

Yields on plantations, installed on the tertiary sands of La Mé and on the Divo plateau soils, constitute the second homogeneous group. During the 2003, 2004 and 2005 campaigns, yields on the Divo tertiary sands plant were 11,500, 12,500 and 13,000 kg/ha/year, respectively. As for planting on Divo plateau soils, yields ranged from 10,500 kg/ha/year (2003) to 12,500 kg/ha/year (2005). These yields on all plantations change positively with the age of the plots.

During the 2002 campaign, the variance analysis did not reveal any difference between the averages obtained on the four study plots. These averages ranged from 10,000 (Palmci plantation to Divo) to 13,500 kg/ha/year (La Mé hydromorphic zone).

Table 4: Summary of total bunches weight produced on all study plots

Types of plantations	Total bunches weight (kg/ha/an)			
	2002	2003	2004	2005
CNRA Lamé (Tertiary sand)	11000 a	11500 b	12500 b	13000 b
CNRA Lamé (hydromorphic soil)	13500 a	14500 a	20500 a	22000 a
CNRA Divo (Low-lying soil)	12500 a	13000 a	19500 a	20500 a
PALMCI Divo (Plateau soil)	10000 a	10500 b	11500 b	12500 b

The averages followed by the same letter are not significantly different at the 5% threshold.

IV. DISCUSSION

In recent years, rainfall has been low, resulting in an increase in the water deficit (DH) in South-east and South-central of Côte d'Ivoire. This finding, confirmed by this study, has already been mentioned by authors such as [18] Buisson and [13] Yao. The decrease in rainfall and the rise of DH are due to the combined action of man and nature [13]. Overuse of forests in the wetland, combined with natural phenomena, has contributed to a significant reduction in rainfall. Seasonal bushfires, anarchic deforestation without sufficient reforestation and extensive slash-and-burn agriculture, to which southern of Côte d'Ivoire is subjected, contribute to worsening the decline in rainfall [19].

Annual rainfall was significantly higher in La Mé, in the South-east, than in Divo, in the South-central region. The geographical location of La Mé region, close to the sea, and the presence of dense evergreen forests would contribute to increased annual rainfall in the south-east of the country. As for the South-central, vegetation, dominated by dense semi-deciduous forest and

gallery forests, is believed to be responsible for the low rainfall recorded at the two Divo stations. The water deficit (DH), resulting from La Mé, remains lower than that recorded in the locality of Divo. The number of rainy days, which were clearly high in both localities, explains the heavy rainfall in La Mé and Divo. The rains, being well distributed throughout the year, thus promote a continuous production of oil palm throughout the year in the South of Côte d'Ivoire.

Rainfall is the main climatic factor for good oil palm productivity. The optimum annual need is 1800 mm of rain, well distributed during the year, or 150 mm per month, on average [20]. Rainfall deficit has an effect on the oil palm reproduction process [21]. Three critical periods of its production are, in particular, susceptible to a lack of water [21]. A lack of water during the period from flower initiation to sexualization, i.e. 42 to 36 months before bunches are harvested, leads to a higher rate of male inflorescences at the expense of female inflorescences. When water deficiency occurs during the period before the inflorescence leaf is emitted, 24 to 20 months before harvest, the risk of aborting this flowering draft becomes high. A lack of water during the

increased phase of female inflorescence also increases the risk of abortion, and significantly reduces the size and weight of bunches. This period is between 15 and 6 months before the harvest of the future bunch. According to [22] Caliman, DH is a factor in yield, as a 100 mm increase in the annual deficit in deficit range of 0 to 500 mm causes a variation in yield of 2.1 tons of bunches, or 10% of potential water deficit production at zero.

This influence of rainfall and water deficit on oil palm production would explain the very high yield and its characteristics recorded on plantations installed on the hydromorphic soils of La Mé and Divo, compared to those installed on the plateau doils of La Mé and Divo. Yield, being linked to the total number of bunches and the average weight of bunch, is dependent on rainfall and water deficit.

Exceptional yields are due to the number of bunches and bunch weight produced per tree in hydromorphic areas with shallow water tables, and which are very favourable to the cultivation of oil palm [23]. According to [24] Djegui and Daniel, the increased availability of water from these areas is necessary for the maturation of bunches, which would reduce the coefficient of productivity variation of oil palms, and maintain stable the average weight of bunch. The availability and excess water in hydromorphic areas mitigate production declines during the year. In general, the rainfall patterns that predominate, especially in Southern of Côte d'Ivoire, involve one or two dry seasons of uneven durations during which the rains are less than the potential evapotranspiration, 100 to 150 mm of water per palm groves [25]. The soil would intervene by its water reserves to reduce or compensate for temporary deficits. These situations, where the water table at a shallow depth (2 to 3 m), would compensate for the adverse consequences of a rainfall deficit. With a view to implementing sustainable management systems, low-water soils could provide ideal conditions for the exploitation of water-intensive crops [26, 27].

Soil water characteristics, particularly the available water area, are of paramount importance as they largely determine the agrological value of soils vis-à-vis the oil palm that is very water-demanding [25]. Therefore, the choice of shallow water table areas (hydromorphic soil and low-lying) is currently an interesting solution for improving the productivity of oil palm. The availability of water permanently, in the shallow layers of hydromorphic and shallow soils, would explain the high productivity of oil palm groves installed on these soil types, which can reach or even exceed 25 tons of bunches per year and per hectare, compared to 18 tons, on the tertiary sands [28]. These situations would contribute to the stabilization and high production of bunches on plantations in hydromorphic areas with low water tables, which could constitute the future of oil palm cultivation in Côte d'Ivoire, as the only conversion of tropical forests to oil palm plantations results in loss of biodiversity and reduced productivity [29, 30, 31, 27].

V. CONCLUSION

It can be concluded that rainfall and water deficit in South-east and South-central of Côte d'Ivoire are discriminating factors in the long-term cultivation of oil palm. With an average of 1700 mm of water per year, the locality of La Mé appears to be more watered than that of Divo, whose average rainfall is 1600 mm of

water. However, in both localities, rainfall and DH are favourable for the cultivation of oil palm.

The study also shows a significant difference between the productivity of oil palm groves set up on hydromorphic soils with low water table (CNRA of Divo and La Mé), and those installed on the tertiary sands (Palmci-Divo and La Mé). This difference is marked by the high productivity of palm groves in hydromorphic areas, which produce 23 tons/ha/year of bunches, compared to 17 tons/ha/year on the tertiary sands during the best years, a gain of more than 30%. Therefore, the choice of hydromorphic zones is currently an interesting solution for improving and increasing the productivity of oil palm in Côte d'Ivoire.

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Size Effect on Mechanical Properties and Mechanical Behavior of Micron-Sized Amorphous Particles

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DOI: 10.29322/IJSRP.10.09.2020.p105110

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p105110>

Abstract- Amorphous micron-sized particles were subjected to a quasi-static compression. A nanoindentation flat punch method has been developed to determine the contact pressure-strain behaviour of single micron-sized amorphous particle. Four groups of particles with same chemical compositions but different diameters were tested. Particle diameters varied from 3.36 μm to 10.05 μm . Three maximum strain levels of 20 %, 30 % and 40 % at constant deformation rate have been applied in the plastic regime. Existing contact mechanics models were discussed and applied to the elastic and plastic regime. The results demonstrate that contact pressure-strain behavior of the amorphous particles in the plastic regime have significant size dependence; the smaller the particle size, the harder the particle behaves. The smaller particles yielded at higher contact pressures. A deflection point that separate elastic regime from plastic regime were observed in the contact pressure-strain curve of the single particle. Cracks in meridian planes exhibit slabbing or axial splitting and seem to be guided around a core structure. A shape pressure drop was observed in the contact pressure-strain behavior of the particle. The elastic range is seen to be much smaller as compared to the plastic range. Stress converges at approximately 4.2 GPa in the plastic-dominant region.

Index Terms- Amorphous particles, size effect, nanoindentation flat tip method, plastic regime

I. INTRODUCTION

Significant advancement is achieved in finding and fabricating diversified novel nano materials through the use of nanoindentation. Nanoindentation is currently established tool for investigating the mechanical properties of micro- and nano-scales [1-2]. Recently, micron-sized particles are recently being used in electronic packaging and Anisotropic Conductive Adhesive (ACA) [3-5]. During the indentation process, load-displacement curves are monitored and recorded. Mechanical properties such as hardness, reduced modulus and material stiffness can be computed from the contact area determined by the contact depth using an area function of the indentation tip. However, technical processes such as ceramic processing, powder tableting and fluidization make use of powders of micron-sized particles [6-11]. It has also being found that nanoindentation has profound societal influence on our world economy and socio-economy development in the area of materials and manufacturing, nanoelectronics, medicine and

healthcare, energy, biotechnology, information technology, and national security. Recently, there have been other indentation phenomena known as indentation size effect (ISE) [12, 31]. This was revealed more than fifty years ago; however, the mechanisms involved are not fully understood. In indentation size effect theory, hardness measured by nanoindentation for most materials turns to increase with decreasing depth of indentation size within a range typically less than 10 μm . This phenomenon is known as indentation size effect. Particle technology has emerged as one of the research area in the study of mechanical properties, however, the development of it is hindered with great challenges that comprises of development of physical models for engineering systems where particles are in contact [11, 13, 14]. Predictive models are important in designing and modeling of particulate processes for unit operations. The challenge is to prognosticate what mechanical properties such as throughput and energy consumptions can succumb to operational parameters in particulate processes. Such operational parameters have significant effect on the mechanical properties of the particles. There have been some progresses in the determination and purposefulness of particle properties in scientific research. Notwithstanding, probing into mechanical properties of particles such as surface effect, composition, dislocation etc. are still in the neonate stage [12, 15, 16]. Recently, the renowned theory of strain gradient plasticity (SGP) evolved by Nix and Gao [17], surface effect of particles [18], uniform deformed and non-uniform deformed microstructure have received rapid attention. Other functional properties of particles have been modeled using computational fluid dynamics approach and also by means of particle trajectory simulation of particulate systems [14, 15]. Mathematical models that can approximate microsphere in the plastic regime were postulated by Mook et al [14, 19]. Mook et al, approximated the behavior of amorphous particle to that of a barrel shape by a cylinder, an assumptions which works for large deformations [14, 19]. The model considered and accounted for the cylindrical shape and volume conservation which paved way for the contact radius to be computed. This model is popularly known as the Mook model [19]. Another particle technology mathematical model is the Hertzian theory [19, 20-23]. Hertzian theory models high loads and small deformations in the linear elastic regime of isotropic solids. Heinrich Hertz in 1882, successful evolved the first theory of non-adhesive point and line contacts of elastic solids [20-23]. The theory predicts the correlation of engineering equations that mimic particle trajectories and its related mathematical models such as applied load, strain, pressure and contact area and enables the

computation of Young's modulus and Poisson's ratio. Hertz assumed a small elliptical contact area between the two solids and approximated each contact partner by an elastic half-space with a plane surface. The half-space approximation developed by Hertz is habituated to contact mechanics and limited to the application of solutions of elasticity theory. Nonetheless, the model of Oliver and Pharr was developed for the application in traditional nanoindentation experiments and did not consider any significant effects generated by the particle shape and its finite volume [24, 25]. However, there were limitations to Oliver and Pharr model. These limitations were curtailed by the introduction of the Johnson's model [1, 19, 26, 30]. Johnson model accustomed Hertzian theory to anatomize the unloading process to limit complications that may appear at large deformations due to interference of the contact stress fields. Other models such as Abbott and Firestone model [19, 27], Etsion model [19, 28] and Li model [19, 29], offer similar solutions to the limitations of the Oliver and Pharr model. In those models, it was assumed that fully plastically deformed microsphere loaded with a maximum force, will recover elastically when unloaded and the particle will increase effective radius of curvature due to plastic deformation. Their solution is universal for nanoindentation process comprising of the loading and unloading processes. In the last decades, size effect of mechanical properties of PS-DVB micron-sized polymer particles in the elastic regime has been studied by He et al [32]. In this paper, we focus on size effect in the plastic regime on mechanical properties and mechanical behavior of amorphous particles. Amorphous particles are taking trend now in particle technology. According to Paul J et al [7], the mechanical properties of a single particle have significant structure-property correlations. Crack propagation happened when particles were subjected to significant increase in load without particles separating into pieces [7]. Paul J et al found out that crack propagation through the particle is strongly size dependent. However, despite the aforementioned applications of particle technology, mechanical properties and mechanical behavior of a spherical micron-sized particle are mostly unknown. Unlike other bulk materials, where stress-strain behavior are mostly known, particle dynamics and its associated stress-strain behaviors are unknown. It is therefore pertinent to study structure-property correlations of individual particles and model the behavior of such particles. In this paper, nanoindenter machine was used to probe the mechanical properties of the single particle at different particle sizes. We employed the Hertz and Mook models [13, 14, 21] to study the size effect and mechanical behavior of the particles. The procedure to characterize the mechanical particle properties consist of localizing the position of individual particles and the application of micron or nano-forces to cause deformation to the particles [33-37]. The objective of this paper is to study size effect plastic regime on mechanical properties and mechanical behavior of micron-sized amorphous particles. Amorphous micron-sized particles on a silica substrate were subjected to a quasi-static compression. A nanoindentation flat punch method have been developed to determine the contact pressure-strain behaviors of single micron-sized amorphous particle. Four groups of particles with same chemical

compositions but different diameters were subjected to micro-compression. Particle diameters varied from 3.36 μm to 10.05 μm . Three maximum strain levels of 20 %, 30 % and 40 % at constant deformation rate have been applied in the plastic regime at a quasi-static strain rate of 0.025 and 0.05/s mainly to observe the size effect. Existing contact mechanics models were discussed and applied to the elastic and plastic regime.

II. EXPERIMENTAL SETUP

1.1.1. Sample Preparation and Methods Used

The Amorphous micron-sized particles used for the experiment were obtained from Xiamen University and were used as received. Energy dispersive spectroscopy (EDS) was conducted to ascertain the chemical elements of the particles (Fig.1.). Table 1 shows the chemical elements of the particle. The Amorphous particles consist of Iron as major element and Silicon, Cobalt, Copper and Niobium as minor chemical elements.

A 12 mm x 12 mm x 0.5 mm Silicon substrate were cleaned in Ethanol and Acetone using high frequency ultrasonic vibration. A 2 mg of micron-sized particles were measured using weight balance machine and dispersed in an Ethanol for 10 minutes. At exactly 10 minutes, drops of the solution containing the particles were dispersed on a 12 mm x 12 mm x 0.5 mm Silica substrate and the diluted dispersions were exposed to ultrasonic vibration to reallocate the positions of the particle array. The Silicon substrates are positioned in a clean environment for thirty minutes for amble drying of the particle in respect to the removal of the remaining Ethanol left in the particles before scanning electron microscopy (SEM) observation. The particles were sputter-coated to initiate conductivity prior to SEM analysis. The SEM micrographs of the smallest and larger particles are illustrated in Fig.2a. Several particles were polished using P5000 abrasive paper and the internal morphologies of particles were observed with SEM and electronic microscope before mechanical testing (Fig.2b, c and d). The observed polished microspheres (Fig.2b) in epoxy no evidence of core-shell feature, no hollow feature, indicating that the particle is not a balloon and no internal cracks (Fig.2c and d) were observed within the particles. Four groups of particles with identical chemical compositions but different diameters have been tested. The diameters of the Amorphous particles varied from 3.36 μm to 10.05 μm . The particles with aspect ratio (*i.e.* Sphericity) and *C.V.s* (*i.e.* coefficient of variance) of the size distributions were measured to be one and zero respectively. 4.37 μm particles were also cleaned with Ethanol and subjected to microcompression to observe the mechanical behavior. Differential Scanning Calorimetry (DSC) tests were performed on the particle. For DSC experiment (Fig.3.), Aluminum pan of melting temperature (T_m) of 660 $^{\circ}\text{C}$ were selected as a reference material. A constant cooling and heat rate of 20 K/min were used for the DSC experiment. The room temperature was 22.49 $^{\circ}\text{C}$. DSC-2000 Machine was used for the experiment. It has a temperature limit of 750 $^{\circ}\text{C}$. DSC test shows the particle is Amorphous.

Table 1. Major and Minor Elements of the Tested Particles

Chemical Elements	Composition (wt %)
Si	6.40
Fe	70.31
Co	10.72
Cu	14.83
Nb	1.39
Total	100 %

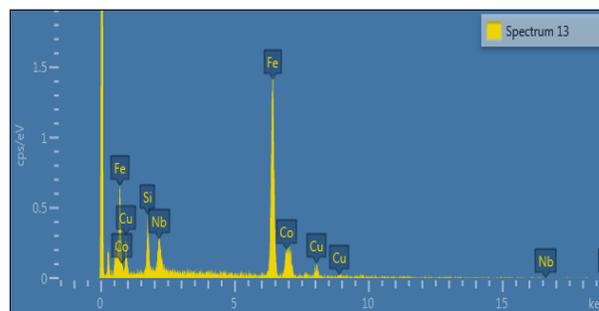


Fig. 1. EDS image of the particle after polishing as a confirmation of the Chemical Elements in Table 1

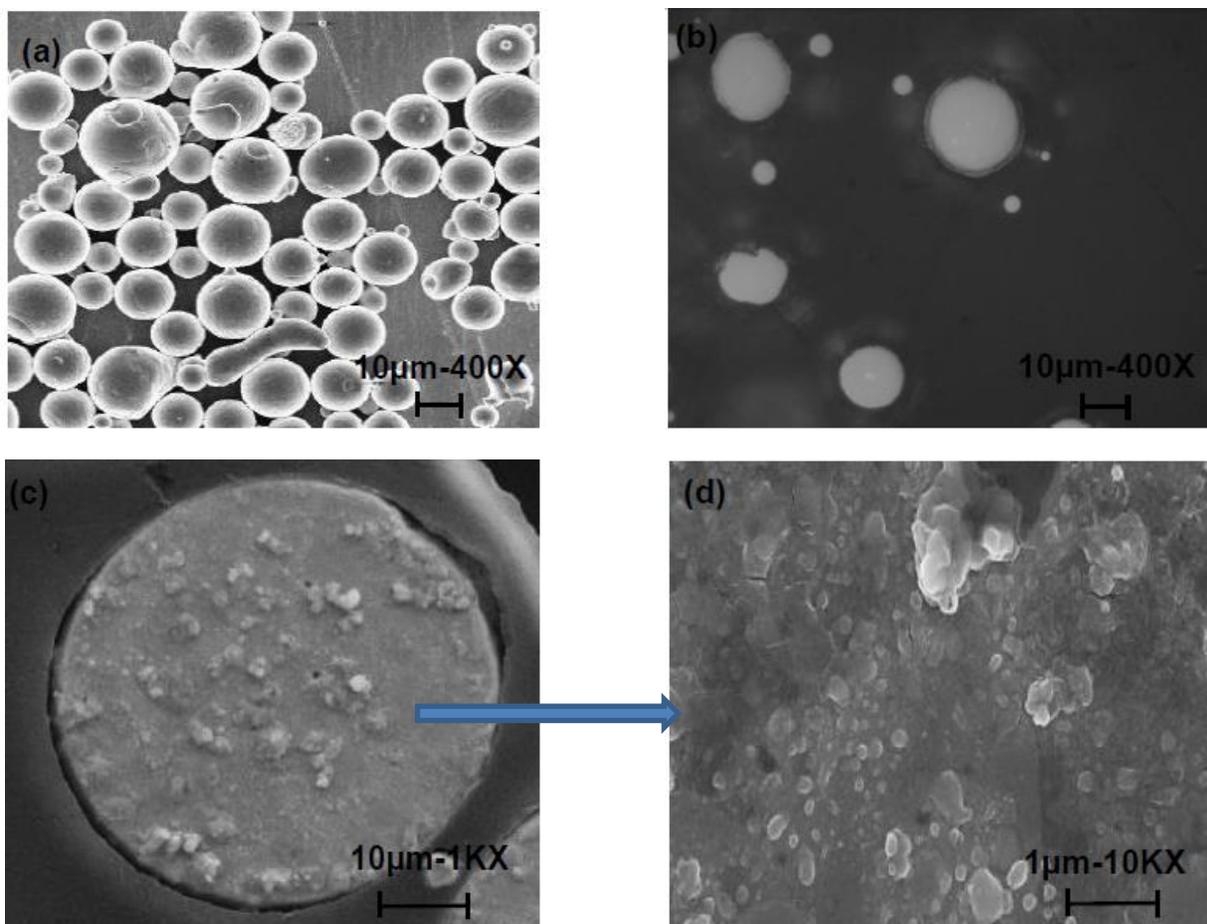


Fig. 2. (a) SEM Micrographs of the smallest particles, broken particles and largest particles (b) Polished microspheres in epoxy no evidence of core-shell feature (c) Polished microsphere shows no hollow feature, indicating that the particle is not a balloon. (d) No internal cracks were observed within the particles.

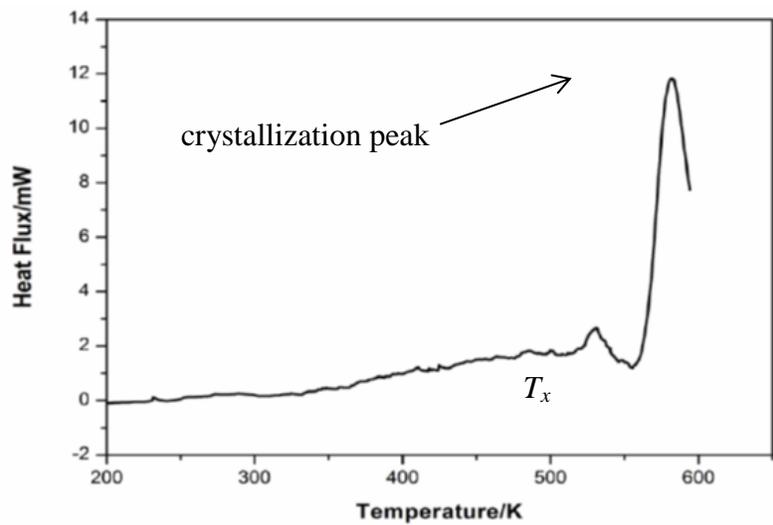


Fig. 3. Shows the DSC Curve for 21mg particles. The crystallization temperature T_x is also characterized by crystallization peak. T_x was measured to be 562.17 °C. Crystallization temperature and the crystallization peak are characteristics of amorphous material. This confirms that the particle is Amorphous. The particle did not show any meaningful glass transition.

The microcompression tests are performed using an Agilent Nano Indenter G200 (Agilent Technologies, Inc. 2013, USA). Agilent Nano Indenter G200 is user-friendly instrument for nanoscale mechanical testing. It has the depth-control mode and strain-control mode features. For this experiment, the depth-control mode was utilized. The depth-control mode is controlled by the indentation depth. The depth-control mode has a maximum indentation depth of 2 μm and a maximum load capacity of 500 mN. It has displacement and load resolution of 0.01nm and 50 nN respectively. A flat tip diamond indenter of size 50 μm was used for the experiment. To achieve unparalleled dynamic range in force and displacement, the indenter planarity has to be calibrated. This is achieved by indenting severally into a polished aluminum surface. For experimental certainty, a clean 50 μm impression on the surface of the aluminum is a threshold for planarity acceptability. Once planarity of the indenter tip is achieved, the flat tip indenter is cleaned from dust for mechanical testing to begin. The optical and it position is also calibrated by

observation of its resolution on the indent surface of the aluminum. Using the optical microscope, an appropriate distance greater than 50 μm between two particles is observed and a single particle is located for the commencement of the mechanical microcompression test. A schematic diagram (Fig.4.) shows a model of a rigid flat punch in contact with a single amorphous particle. Schematic Plots (Fig.5.) of the particle behavior at different stages which describe the Hertzian and Mook model. The Mook model [14, 19] was used to analyze the contact pressure-strain curves since it is valid in the plastic regime where strain ($\epsilon > 0.1$).

All microcompression tests were performed at room temperature (24 °C). The displacement controlled mode which operates the indentation depth versus time is selected in order to control the nominal strain rate for each group of particles. Strain rates were 0.05/s and 0.025/s at speed of 10 nm/s, peak hold is 2s for creep, loading and unloading time is 3 minutes, 20 seconds. Total indentation depth is 2000 nm for all selected particles.

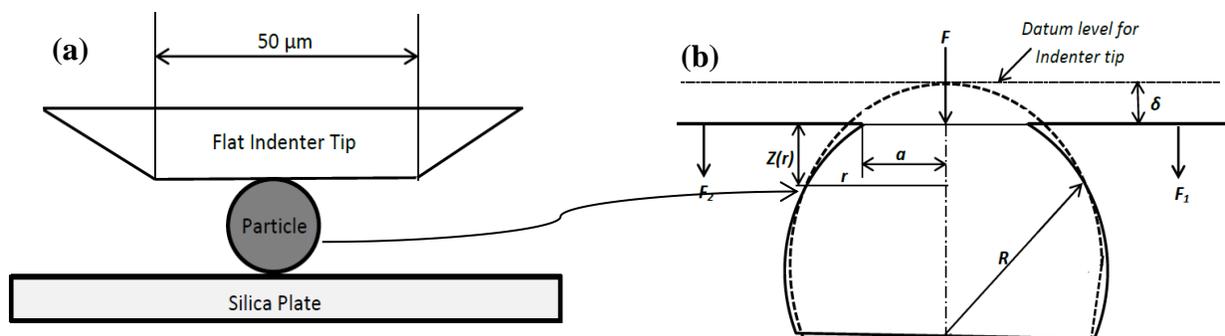


Fig. 4 (a) Model of Flat Punch Test and (b) Enlarged Model Description of Particle

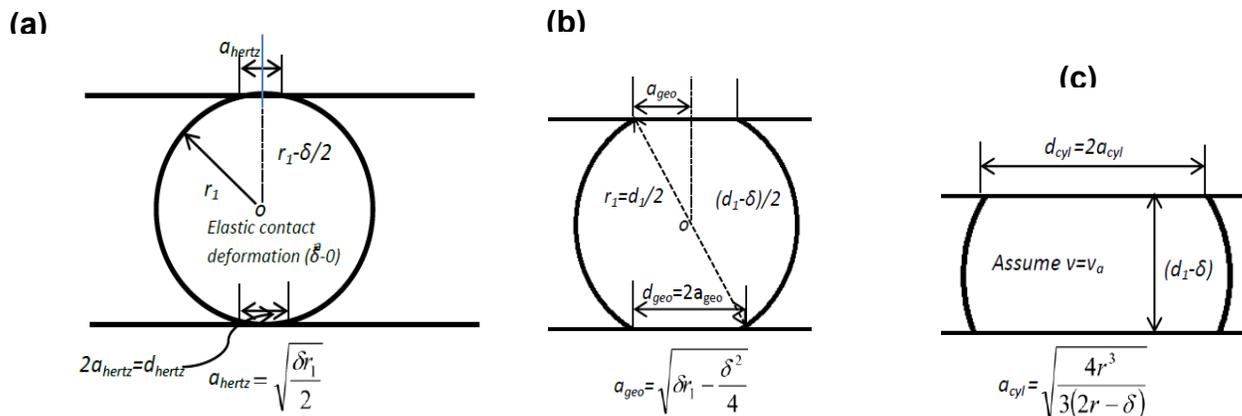


Fig. 5. Schematic Plot of the particle behavior at different stages (a) Hertzian model is valid in elastic regime where strain ($\epsilon \leq 0.1$) only, (b) and (c) Mook model valid in the plastic regime where strain ($\epsilon > 0.1$). Where the particle turns to be more barreled shaped. Indication of ductile failure in particle deformation.

After compression of individual particles, two deformation levels 30 % and 40 % were applied in the plastic regimes which correspond to strain rates of 0.025/s and 0.05/s with reference to particle diameter. For mechanical behavior of 4.37 μm , a quasi-static strain rate of 0.05/s was used. Hundreds of particles have been compressed to ascertain the accuracy of the results. All particles were compressed to indentation depth of 2000 nm.

III. RESULTS AND DISCUSSION

Force–displacement curves are obtained for all selected amorphous particles at two quasi-static strain levels of 0.025/s and 0.05/s at same indentation depth of 2000 nm respectively as shown in Fig.6 (a) and (b). In Fig. 6 (a), the particles were compressed to a maximum indentation depth of 2000 nm and the experiments were repeated severally to ascertain its accuracy. In Fig. 6 (b), the particles were also subjected to a maximum indentation depth of 2000 nm and the tests were repeated periodically for experimental certainty. It could be seen that the force-displacement behaviors of Fig.6 (a) and (b) for all four different sizes of particles are quite similar, repeatable and consistent. As compared to typical bulk amorphous materials, disparities in microstructure, anisotropy and molecular weight can cause significant variations in mechanical properties [38-40]. Hence, the coherent force–displacement curves substantiated by individual particles at the same indentation depths denote a very homogeneous material including size distribution, microstructure, composition and molecular weight. In addition, it denotes confidence to the experimental certainty and precision. During the microcompression, the volume and Poisson's ratio of the amorphous particles may change incessantly with the strain because of the spherical geometry. Therefore, the Mook model [14, 19] which satisfies microspheres in both the elastic and plastic regime was employed to model the behavior of the amorphous particles. To compare the mechanical properties of particles with different sizes, the geometric Mook model equation (Fig.5b) that models contact pressure–strain behaviors of amorphous microspheres have been used. The Mook model is

applicable to amorphous particles compressed at strain greater than 10 %. The model is shown in equation (1) and (2).

$$P_c = \frac{P}{\pi a_{geo}^2}, \text{ where } a_{geo} = \sqrt{\delta r_1 - \frac{\delta^2}{4}} \quad (1)$$

$$\epsilon_p = \frac{2\delta}{D} = \frac{\delta}{R} \quad (2)$$

Where P_c is the contact pressure, ϵ_p is the nominal compressive strain, P is the contact load, D is particle diameter, R is the initial particle radius, and δ is the half deformation of the spherical amorphous particle (Fig.4 (b)). Fig.7. (a) and (b) shows deflection points that were observed for onset of plasticity/yielding. These points are indicated as A, B, C and D for 3.36 μm , 4.39 μm , 7.19 μm and 10.05 μm for 0.025/s and 0.05/s. Deflection points were taken as onset of plasticity, so that size effect is studied after the deflection points. The deflection points separate elastic-plastic regime from the plastic regime for each particle size. The contact pressure–strain curves of the four groups of particles at two strain rates are displayed in Fig. 8 (a) and (b), respectively. The unloading part which is purely elastic in nanoindentation experiments has been omitted in the contact pressure–strain behaviors Fig. 8 (a) and (b). From the contact mechanics studies, contact pressure–strain behaviors are one of the constitutive mechanical properties of materials. For particles with different sizes but same chemical compositions, same indentation depth and same strain rate, all the contact-pressure–strain curves should collapse into one phase. Fig. 8 (a) and (b) clearly shows that the smaller particles yielded at higher contact pressures than bigger particles. Contact pressure–strain behaviors of particles at 20 %, 30 % and 40 % in the plastic regime are

strongly size-dependent, the smaller the particle size, the harder the particle behaves. The smallest particle is the hardest because it is characterized by higher contact pressure, while the biggest

particle is the softest. As particle size increases, the size dependence in the plastic regime of contact pressure-strain behavior diminishes gradually.

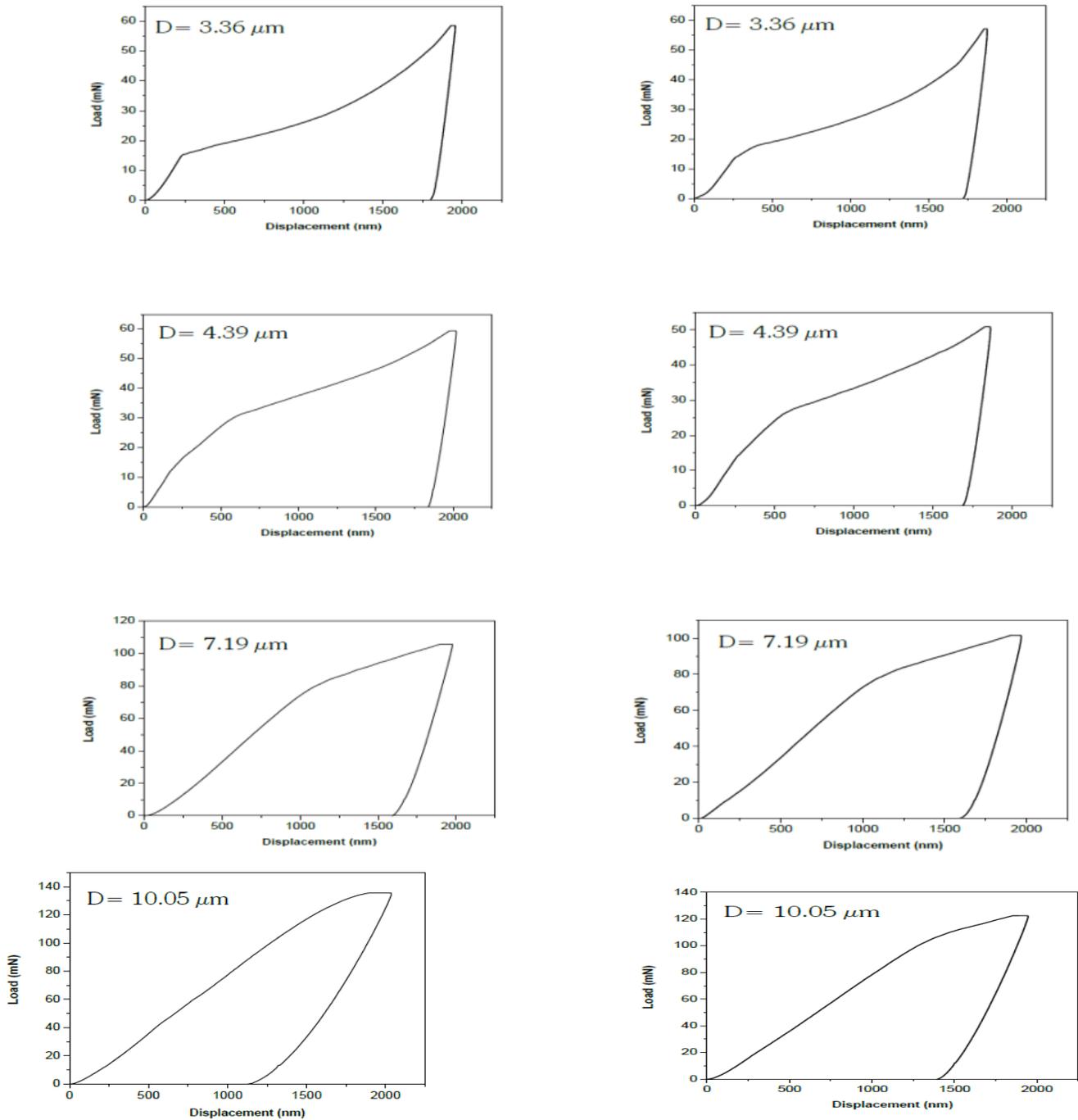


Fig. 6. Force-displacement curves of four different sizes of particles (a) With strain rate 0.05/s at 2 μm indentation depth (b) With strain rate 0.025/s at 2 μm indentation depth.

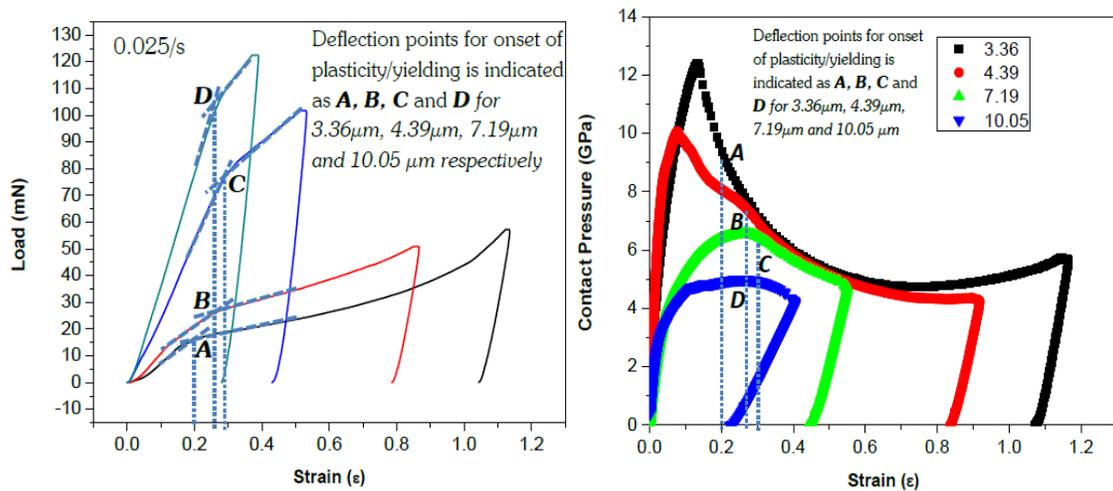


Fig. 7. (a) and (b) Deflection points for onset of plasticity/yielding is indicated as A, B, C and D for 3.36 μm , 4.39 μm , 7.19 μm and 10.05 μm for 0.025/s and 0.05/s. Deflection points were taken as onset of plasticity, so that size effect is studied after the deflection points. The deflection points separate elastic-plastic regime from the plastic regime for each particle size.

Fig.9. Contact pressure-strain curves (a) at 30 % deformation with strain 0.05/s strain rate (b) at 40 % deformation with strain rate 0.025/s. For particles with different sizes but same chemistry and the same strain rate, at 30 % and 40 % deformation in the plastic regime, all the stress-strain curves should collapse into one phase. But Fig.9 (a) and (b), clearly show that the contact pressure-strain behaviors of particles are strongly size-dependent, the smallest particle is the hardest while the biggest particle is the softest. With the increase of particle size, the size dependence of contact pressure-strain behavior diminishes gradually. Fig.9 (a) and (b) indicates that smaller particles size shows higher contact pressure than bigger particles. From Fig.10., particle size dependence of the normalized contact pressure with strain rate 0.025/s and 0.05/s respectively at deformation level 20 %, the contact pressure of all the four groups of particles at 20 % deformation level in the plastic regime is normalized by the corresponding value of the smallest particle. Particles display distinct size effect at both strain rates. The contact pressure of the biggest particle is about 50 % lower than that of the smallest particle at a strain rate of 0.025/s. As the strain rate increases to 0.05/s, the size effect becomes even more pronounced in the plastic regime. The size effect seems to have different trends depending on the strain rate. With the smaller strain rate, the size effect is most evident for the three smaller particle sizes, whereas for the larger strain rate the size effect is more evenly distributed.

There are dissimilarities in the compression modes of failure in amorphous particles compared to their bulk counterpart due to the absence of dislocations [41]. There are three types of compression modes of failure in amorphous particles [1, 2]: Slabbing or axial splitting, crazing or shear banding and microcracking [34, 42, 43]. Slabbing or axial splitting occurs in the absence of confining pressure, where the cracks seems to be initiated parallel to the applied compressive stress. At moderate confining pressure, cracks nucleate within the material to form a “shear zone” [42, 43]. For crazing, a displacement develops tangentially to the surface of displacement. At high confining pressures, distributed microcracking is in evidence. For

microcracking, failure occurs as a series of multiple shear fractures distributed throughout the sample volume with no specific crack orientation [1, 2]. The material is said to be “ductile” due to the similarity of shape of the uniaxial stress-strain curve with that obtained on tests with ductile materials. In ductile fracture, extensive plastic deformation takes place before fracture [42]. Ductile behaviors exhibit a deflection point followed by strain softening, usually associated with crazing or shears banding which leads to ductile fracture. It is also delineated by a sharp pressure drop or a plateau in the contact pressure-strain curve [Fig.13]. In brittle fracture, no apparent plastic deformation takes place before fracture [1, 2]. Brittle fracture is depicted by invisible yield point and follows Hooke’s law specifically at low strain level. In microcompression tests, compressive failure of amorphous particles is characterized by “barreling” and failure is due to yielding, which can be characterized by the compressive yield strength of the material [Fig.11] and [Fig.12]. Generally, the compressive yield strength for amorphous particles does not change significantly with varying loading mechanisms and can be regarded as a material property.

In [Fig.11.], a 4.37 μm amorphous particles were microcompressed to a maximum strain of 0.96, after microcompression, microspheres show cracks in meridian planes. Cracks in meridian planes were slabbing or axial splitting and seem to be guided around a core structure that is attributed to the synthesis process. The crack features were indicated by D, E, F, G, H, and I [Fig.11]. The particle turns to be more barreled-shaped, which is an indication of ductile failure in particle deformation. Investigation on the compressed load-depth curve [Fig.12], we observed a deflection point which separate elastic-plastic regime from the plastic regime. Three stages in the mechanical behavior of particle were seen [Fig.12]. Stage (1) on the load-strain curve [Fig.12] shows nose effect of the indenter tip. Due to the geometry of the indenter tip, method of attachment, and boundaries of each contacting bodies, nose effect in microcompression of particles are bound to occur [2]. Although, the contacting bodies (i.e the particle and indenter tip)

are in frictionless contact, nose effect is just the starting point of the microcompression test. It may cause uncertainties in nanoindentation experiments. However, it could be seen in [Fig.12.] that the nanoindentation test started exactly at origin, which indicates nose effect is minimized in this experiment. That is, only a non-uniform pressure is transmitted between the indenter tip and the particle at that stage [1, 2]. Stage (2) is elastic-plastic deformation stage [Fig.12]. At that stage, the behavior of the particle is non-linear [Fig.14]. A deflection point was observed that separate the elastic-plastic from the plastic region. The elastic-plastic stage happens within a strain limit of 0 to 0.27 [Fig.12]. At that stage, a non-uniform pressure distribution exist which might have caused initiation of crack [1, 2]. Stage (3) is dominantly plastic deformation stage. This plastic regime occurs after the deflection point. As indicated in the contact pressure-strain curve [Fig.12] and [Fig.13], as compressed depth increases the elastic-plastic regime is seen to be much smaller as compared to the plastic regime. The elastic-plastic deformed zone (2) decreases with increasing strain and become much smaller than the zone with plastic deformation. The mean contact pressure decreases at this stage [2]. In a plastic dominant regime, a uniform pressure distribution exists [1, 2]. Stress converges at approximately 4.2 GPa in the plastic-dominant region [Fig.13]. The early stages of (2) shows a sharp pressure drop with no evidence of pop-in event within a strain limit of 0.1 and 0.2 which lies in the Hertzian first pop-in regime [21, 22]. Pop-in events in bulk amorphous materials are an indication the material is yielding [7, 34], however, the fact that the amorphous particle did not experience pop-in events does not mean the material is not plastically deformed. Due to the material composition and dislocation free in some amorphous particles, pop-in event may not happen. The particle completely fractured at a strain of 0.91 [Fig.13] and [Fig.11 (c)] starting from a peak stress of 10 GPa. The final mean contact diameter of the fractured particle was measured to be 2.8 μm using SEM [Fig.14]. It was substituted into the geometric Mook model to generate the behavior of the particle. The true behavior of the particle measured in SEM was then compared to the cylindrical

Mook model and Hertz model. It could be seen that the contact diameter measured in SEM shows almost the same behaviour as compared to the Mook model and Hertz model [Fig.14]. The graph of cylindrical Mook model d_{cyl} [Fig.14], which indicates that the particle is in the plastic dominant regime, the graph was observed to be linear in both stages (2) and (3) within strain limits of 0 to 0.27 and 0.27 to 0.96 respectively. An indication that means that uniform pressure distribution exists and the particle is deforming plastically. However, no shear bands were observed during deformation. At that point, the particle assumes a barrel shape [Fig.11. (C)]. The graph of geometric Mook model d_{geo} [Fig.14], which is a model that is used to predict the behaviour of a particle in elastic-plastic and plastic regime, shows that at elastic-plastic deformation stage (2), the contact diameter of the particle increased with increase in strain delineated by non-linear behavior. However, stage (3) shows a linear behavior that means the particle is plastically deformed. The graph of the Hertz model d_{hertz} [Fig.14], which is a model that is used to predict the behavior of a particle in elastic-plastic regime only, it was obvious in stage (2) that the behaviour of the particle is non-linear within strain limits of 0 to 0.27. That confirms that the particle is still in the elastic regime and therefore a non-uniform pressure distribution dominate in that region. However, d_m , contact diameter measured in SEM, [Fig.14], reveals that in the plastic domain region (3), the contact diameter of the particle changes almost linearly with the strain (this is where the particle takes the barrel shape). It is a plastically dominant regime where compressive stresses converged at 4.2 GPa. At that point, plasticity would have remained constant at 4.2 GPa and free volume annihilation might have occurred. In stage (2) [Fig.14], a polynomial (non-linear) behavior was observed whilst stage (3) depict that of a linear behavior. However, the Mook model did not fit exactly with the contact diameter measured in SEM. The reason may be experimental uncertainties. The true behavior of the particle is made up of non-linear in the elastic-plastic regime characterized by linear behavior in the plastically dominant region [Fig.14].

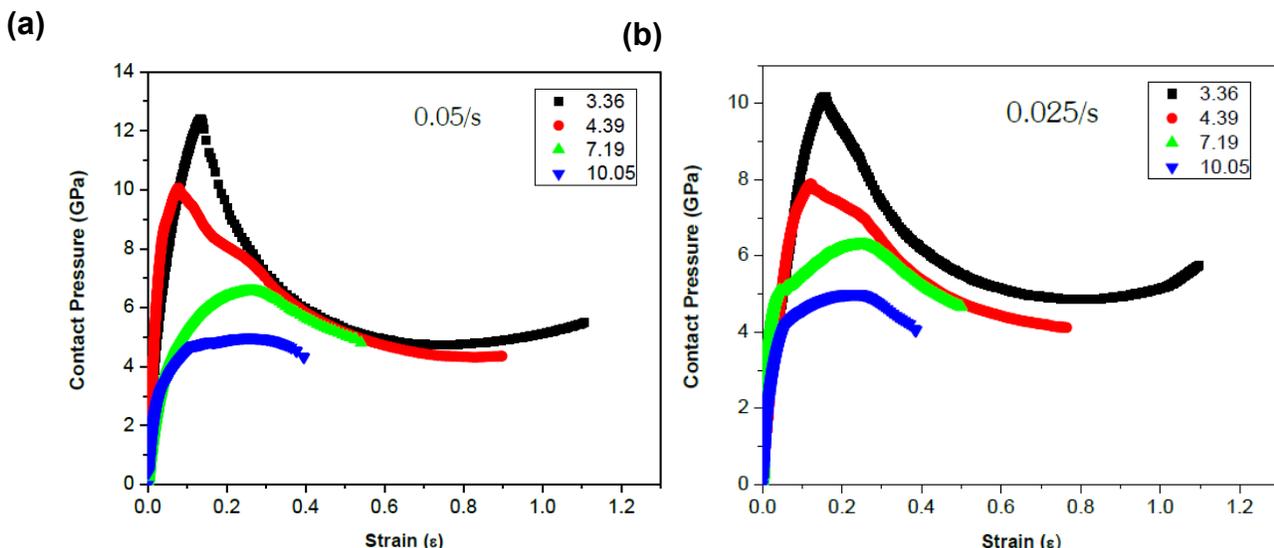


Fig. 8. Contact pressure-strain behaviors of particles exhibiting size-dependent at (a) 0.05/s and (b) 0.025/s respectively.

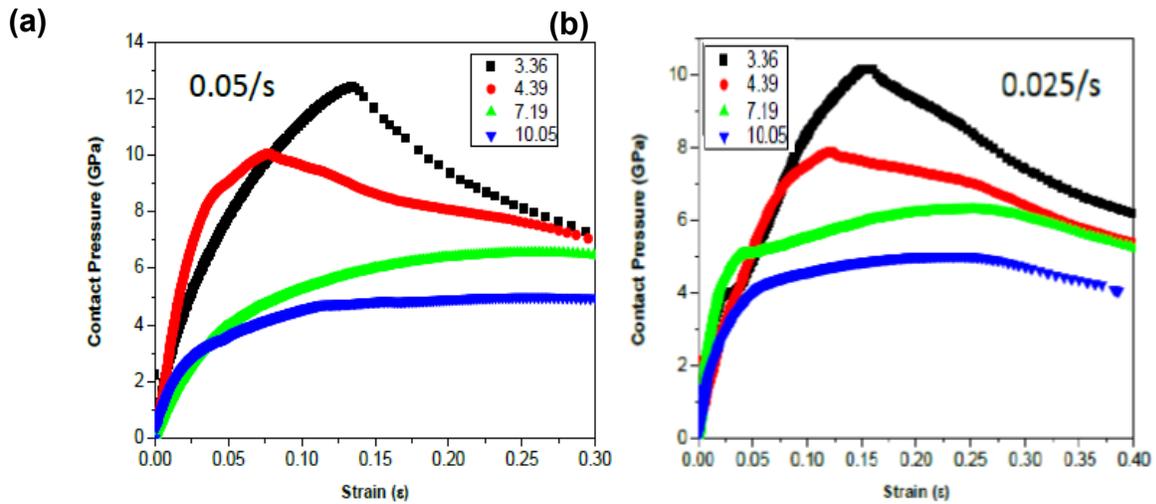


Fig.9. Contact pressure-strain curves (a) at 30 % deformation with strain 0.05/s strain rate (b) at 40 % deformation with strain rate 0.025/s. Both graphs show size effect in the plastic regime.

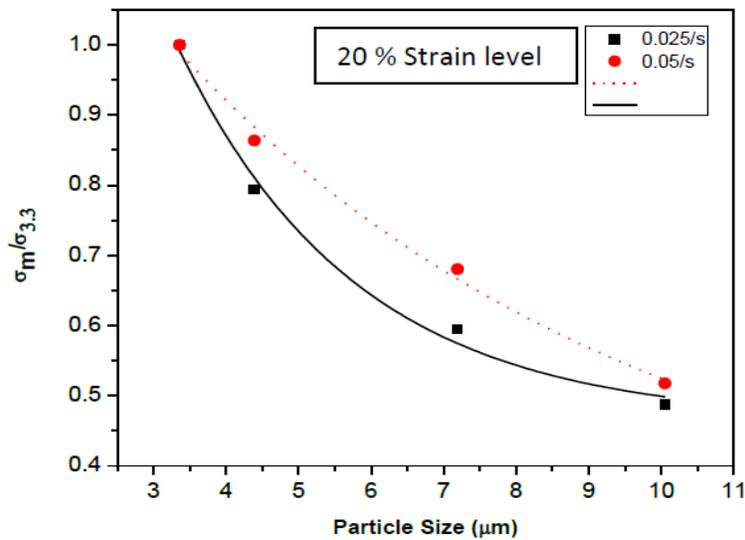
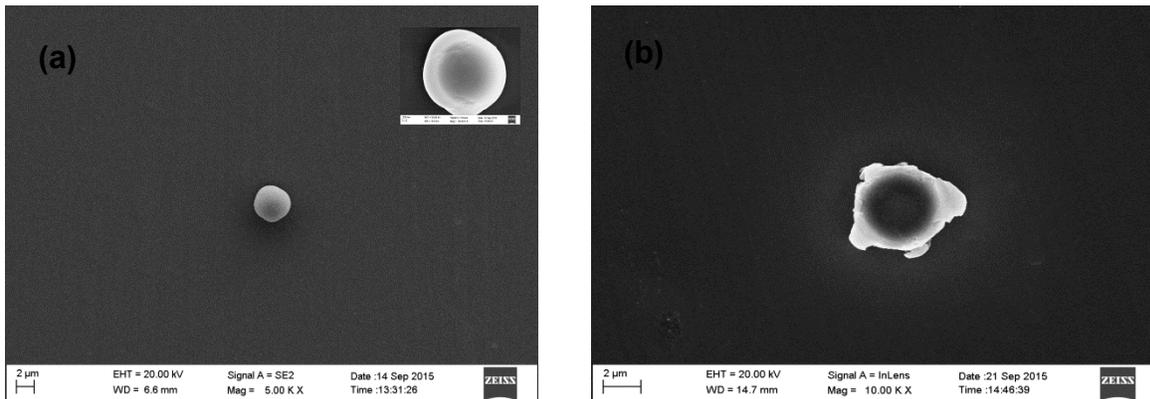


Fig. 10. Particle size dependence of the normalized contact pressure with strain rate 0.025/s and 0.05/s at deformation level 20 %.



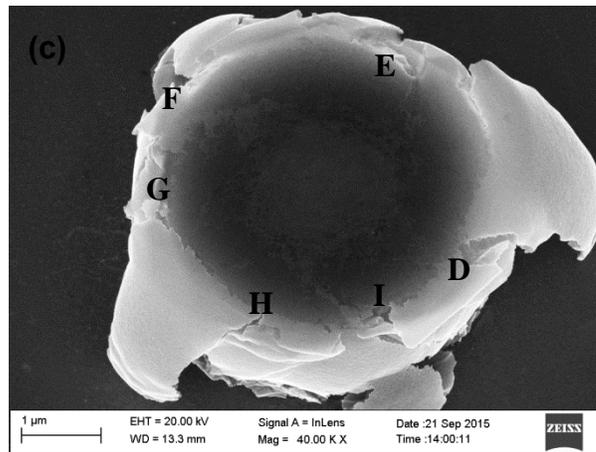


Fig. 11. (a) Particle before test (b) and (c) The particle were loaded to a maximum strain of 0.96, after compression, microsphere barreled and show cracks in meridian planes as indicated by *D, E, F, G, H* and *I*.

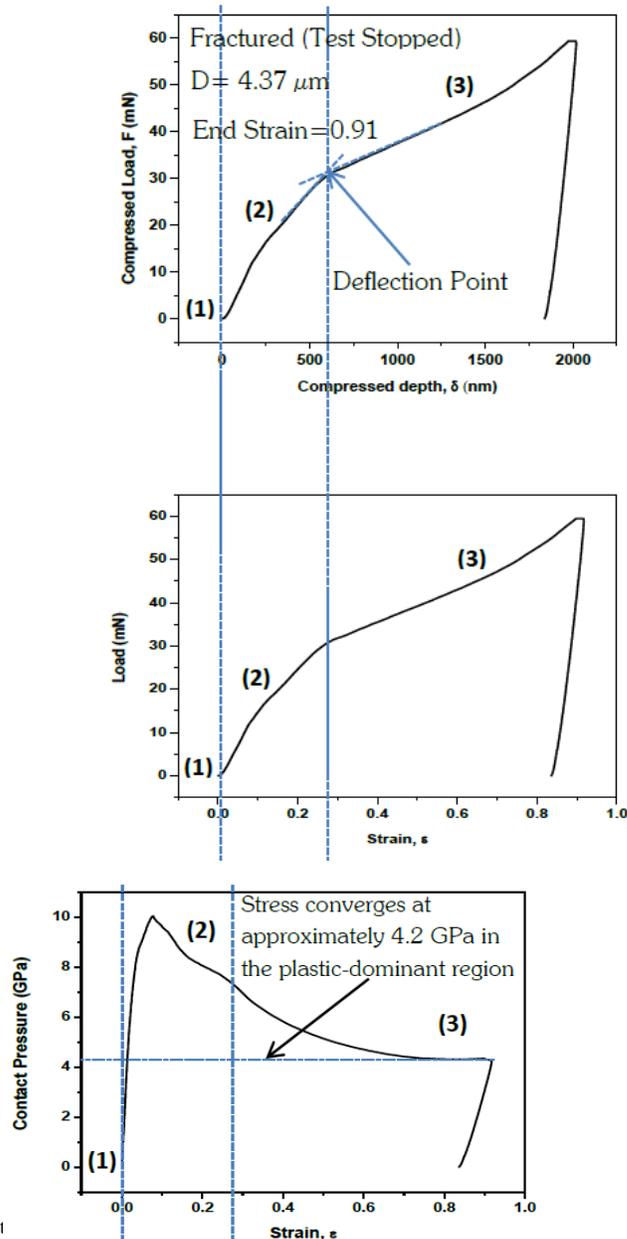


Fig. 12. Stage one shows nose effect of the indenter tip (2) Elastic-plastic deformation stage. Deflection point was observed that separate the Elastic-plastic from the plastic region. (3) Dominantly plastic deformation.

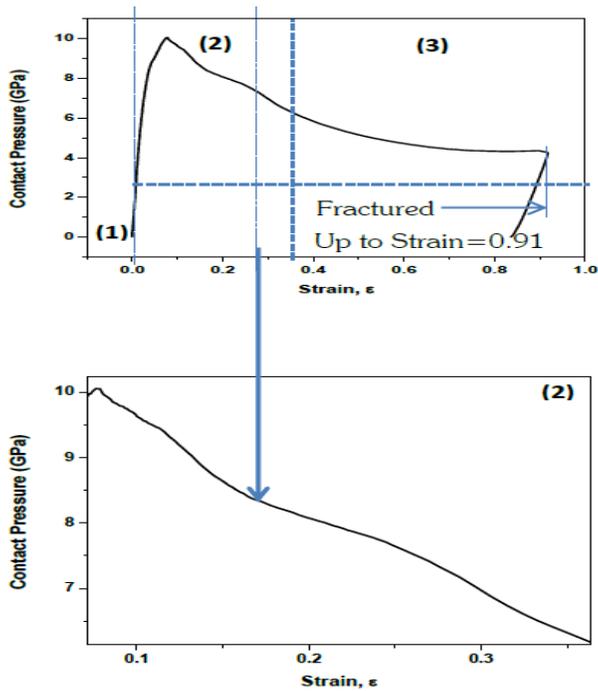


Fig. 13. The elastically deformed zone decreases with increasing strain, and become much smaller than the zone with plastic deformation in (2). The early stage of (2), shows a sharp pressure drop with no pop-in event.

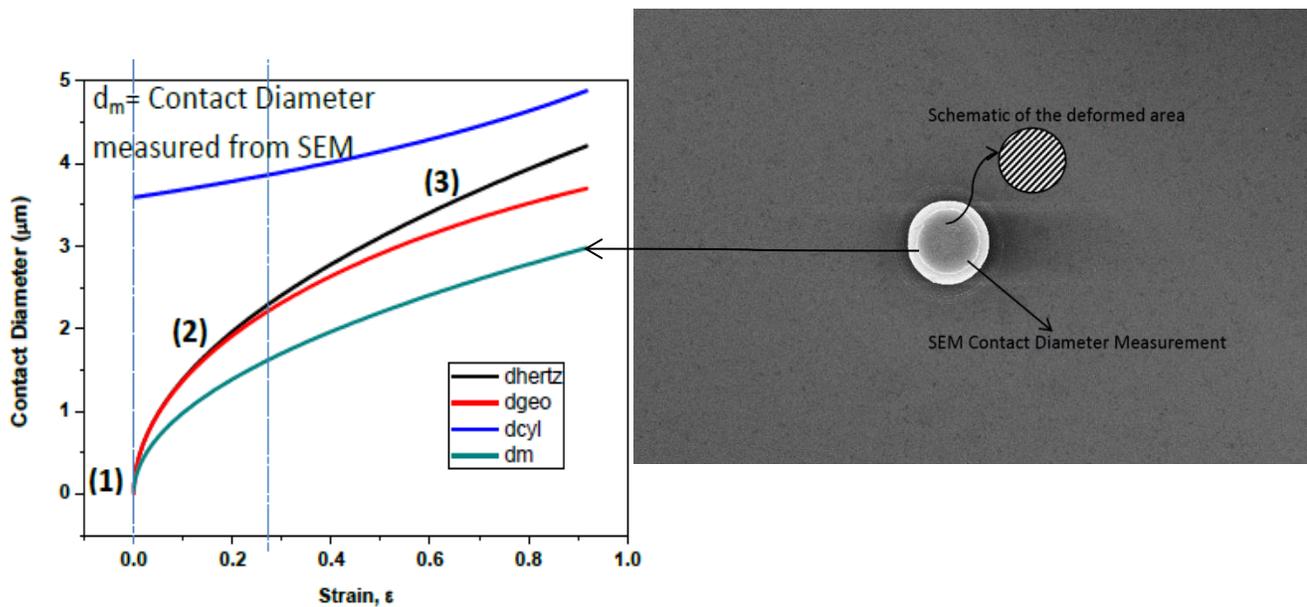


Fig. 14. (2) Elastic-plastic deformation stage, the contact diameter of the particle increased with increase in strain as compared to the other three contact models. However, it was seen in the plastic domain region (3) that the contact diameter of the particle changes almost linearly with the strain (this is where the particle takes the barrel shape).

IV. CONCLUSION

By using a nanoindentation-based flat punch test method, the mechanical properties and behavior of four groups of amorphous micron-sized particles have been studied. A clear distinction between the elastic-plastic and plastic regime has been probed. A deflection point was observed in the load-strain graph. The particles are made of same chemical compositions but different sizes, 3.36 μm , 4.39 μm , 7.19 μm and 10.05 μm . The contact pressure–strain curves are calculated from the indentation load–displacement results. The contact pressure–strain behavior up to 20 %, 30 % and 40 % deformation is considered. Cracks in meridian planes exhibit slabbing or axial splitting and seem to be guided around a core structure. A shape pressure drop was observed in the contact pressure-strain behavior of the particle. The elastic range is seen to be much smaller as compared to the plastic range. Stress converges at approximately 4.2 GPa in the plastic-dominant region which shows a ductile failure. The results demonstrate that contact pressure–strain behavior of the amorphous particles in the plastic regime have significant size dependence: the smaller the size, the harder the particles behaves.

ACKNOWLEDGEMENT

The authors acknowledge Shenyang National Laboratory for Material Science, Institute of Metal Research, Chinese Academy of Sciences, for sponsoring this research.

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Knowledge of “Agrahara” Medical Insurance Scheme among employees of a selected public sector institution in Sri Lanka

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DOI: 10.29322/IJSRP.10.09.2020.p105111

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p105111>

Abstract: The objective of this research was to assess the Knowledge of “Agrahara” Medical Insurance Scheme among selected group of policy holders in Sri Lanka and descriptive cross-sectional study design was used. Three hundred and seventeen (89.04%) were responded.

“Agrahara” was the only health insurance for 83.9% respondents. There was a statistically significant relationship ($P = 0.022$) between gender and knowledge on “Agrahara” insurance premium while only 32.5% knew their premium. Among respondents knowledge on benefit types vary from 10.1% to 79.2%. But overall knowledge was poor as 10.0%. Only 4.5% knew that all 10 benefit types are covered and 18.2% didn’t know any type. There was statistically significant Relationship between gender and knowledge on paralysis coverage ($P = 0.001$), respondents’ spouses employment in government sector and knowledge on childbirth coverage ($P = 0.045$), service period and knowledge on cancer cover ($P = 0.003$). There was a clear knowledge gap between groups on coverage of dependent parents and government employed spouses.

Overall knowledge on “Agrahara” was poor among public sector employees especially with regard to benefit types and benefit groups. Therefore, dynamic awareness programmes are essential to uplift the awareness and thereby to improve vertical and horizontal utilization in order to fulfill “Agrahara” objectives.

Key Words – Medical Insurance, Alternative health financing, Out of pocket spending, Knowledge.

INTRODUCTION

Sri Lanka is a service sector dominated lower middle-income country and it accounts for 56.6% of GDP [1]. Sri Lankan population was 20,359 thousand as per last census held in 2021[2]. By the end of 2013 public servant population was 1,081,045 [3]. The Government sector as well as the private sector contributes for health care delivery and government sector dominates with 55% of GDP expenditure [4].

Although Sri Lanka is remarkably successful in delivering efficient and good quality health services health sector challenges are evolving. Increasing private health services demand, demographic and epidemiological transitions, increasing non communicable disease burden risks leading to inequalities in health care access, weak transferring of information by private sector and incorporation of common goals for both private and public sectors [5] are few of them.

Government health financing is mainly done through tax revenue collection and 83.6% of tax is collected through indirect taxation [6]. Therefore, general public has to pay more and more by way of indirect taxes to receive free health care at point of delivery. Share of health financing for government sector was Rs. 165billion [4], Rs 138.4 billion, Rs.177.8 billion [1] and Rs. 165 billion [7] in year 2013, 2014, 2015 and 2017 respectively.

Gradual decline of allocation of funds expresses the financing difficulties faced by the government and outstanding health financing feature is heavily dependent on private sector despite the free health care at the point of delivery by public sector [8]. Out of total country health financing, nearly 40% is out of pocket spending and personal health insurance also comes under it [4]. Out of the total private sector health expenditure 95.8% is out of pocket spending (OOPS) and it results in household catastrophic health expenditure with lacking financial protection [8]. A recent study has revealed that community based health insurances strongly support reducing out of pocket spending by the way of providing financial protection. Enterprise financing schemes like “Agrahara” and voluntary contributory health insurance schemes are the two main health care financing systems in Sri Lanka and which accounts for very small proportion [4].

“Agrahara” medical insurance scheme was initiated in 1997 by the government with prime objective of uplifting the living standards of public servants and it covers all the public servants and close family members except for the members of the three forces [9].

When consider the average size of the household of 3.8 [10], total coverage is approximately 3 million citizens including all the pensionable employees. It accounts for nearly one fifth of Sri Lankan population which is a quite significant amount.

Government sector inpatient admissions in 2013 were approximately 5.9 million [4] and it is 28.8% of the total population. In 2013 number of claims for “Agrahara” was 103,721 out of which government and private hospital inpatient claims were 48,912 and claims for spectacles was 52,831 [9]. Hence out of the “Agrahara” entitled population only 1.63% has utilized the benefits under inpatient category. If the numbers of inpatient claims are compared with the total government sector inpatients in 2013 it accounts to only 0.83% [4]. Despite the fact that 15% of the Sri Lankan population is entitled to “Agrahara” only 0.83% of the inpatient admissions have utilized the “Agrahara” benefits.

As per the National Insurance Trust Fund (NITF) 2013 “private hospital claims for other illnesses” were 12,262 (31%) whereas government hospital claims for other illnesses were 27,162 (69%) [9].

What all those figures indicate is that the utilization of “Agrahara” medical insurance scheme is very low and out of those who utilized same, the majority received health care through government system. This is a double burden to government.

The monetary value of the private hospitals claims for other illnesses amounted to Rs.519,433,054 whereas this figure for the government hospitals was only Rs.135,187,766 [9]. Hence it is evident that 79% of the claim value has been distributed among only 31% of the total claims made in respect of private hospital treatments.

As per the National Insurance Trust Fund financial statements total contribution collected for “Agrahara” Scheme in the year 2013 was Rs.1,406,706,842 [9] and treasury contribution was 29.15%. The total insurance benefit claims for that year was Rs.1,130,123,071 [9] and it is 77% against net weighted premium without considering return from investments on treasury bonds, treasury bills and Debentures. Therefore, the return is not at the optimum level even though treasury contributes nearly 30% to the NITF. Above calculations further emphasize the double burden on government and raise the question of high claims for low admissions in private sector and whether there is any impact on seeking health care through private sector.

Therefore, study of knowledge on “Agrahara” is important in view of effective health financing together with reducing catastrophic health expenditure of public through enterprise insurance schemes.

The objectives of the present study were to assess the knowledge on “Agrahara” medical insurance scheme by employees at the Head Office of Department of Motor Traffic, Sri Lanka, with respect to 1) socio demographic characteristics, and 2) benefit categories.

RESEARCH ELABORATIONS

Methods

Descriptive cross-sectional study design was used, involving employees at the Head Office of Department of Motor Traffic, Sri Lanka. The survey was conducted in English Sinhala and Tamil languages, depending on the preference of the participants. The study protocol was approved by the Ethics Review Committee, Postgraduate Institute of Medicine, University of Colombo.

Study Populations

The study population consisted of total employees attached to the Head Office of Department of Motor Traffic Sri Lanka who are eligible for “Agrahara” medical insurance scheme. Employees who have not given consent and not completed at least two years of public service excluded for the study. Of the eligible sample of 356, yielding an 89.04% response rate.

Survey

The primary survey tool incorporated was validated and pre-tested self-administered questionnaire. Content validation was done to collect data to adequately cover all study objectives by two economic specialists in Central Bank of Sri Lanka. Questionnaire was pre-tested in two levels to improve the compliance.

Questionnaire was given to employees of 26 units of department through a unit coordinator with prior explanation of the purpose and ethical considerations. Consent forms and information sheets were distributed with the questionnaires and responded without consent were excluded from the study.

Definition of Outcome Measures

The focus of this study was to assess the knowledge on “Agrahara” medical insurance scheme by employees at the Head Office of Department of Motor Traffic, Sri Lanka. Therefore, the relevant sociodemographic and knowledge among public sector employees were assessed at the time of survey. Knowledge outcomes and utilization influencing factor outcomes were assessed for the two years. Knowledge was surveyed among policy holders.

Analysis

At the first stage all the data were entered to the original data sheet. Dummy tables were prepared according to the requirements of the objectives. Relevant frequency distributions were generated by original dataset. Data analysis was done using Statistical Package for Social Sciences version 21 (SPSS 21) software.

Statistical Methods

Age and service period was descriptively analyzed and generated mean and standard deviation as well. Cross tabulations were mainly carried out to find statistically significant relationships with outcome measures including socio demographic factors. The Pearson's Chi-square test was used to determine the significance level. P value set at 0.05 to determine significant level.

RESULTS & DISCUSSIONS

The mean age of the sample was 46.8 years while mean service duration was 21.29 years. The highest educational level of majority of the sample was G.C.E Advanced Level (43.7%) and 24.7% was educated up to degree level.

Total insurance penetration of the sample with regard to other insurances was 16.1%. Therefore majorities (83.9%) alternative health financing was "Agrahara" scheme. Even though the female male ratio of the country population is 11:9 for the own personal insurance it was 5:1. Therefore it is obvious that males were still not futuristic in health financing.

Least educated group had significantly high percentage (37.5%) of personal insurance penetration despite evidence of poor understanding of insurance concept among low educated groups [11]. Study also shows higher educated groups, higher level employees and employees with long service were not protected over health condition unless for "Agrahara" scheme.

There was a statistically significant relationship ($P = 0.022$) between gender and knowledge on "Agrahara" insurance premium while only 32.5% knew their premium. Among respondents knowledge on benefit types vary from 10.1% to 79.2%. But overall knowledge was poor as 10.0%. Only 4.5% knew that all 10 benefit types are covered and 18.2% didn't know any type. There was statistically significant Relationship between gender and knowledge on paralysis coverage ($P = 0.001$), respondents' spouses employment in government sector and knowledge on childbirth coverage ($P = 0.045$), service period and knowledge on cancer cover ($P = 0.003$). There was a clear knowledge gap between groups on coverage of dependent parents and government employed spouses.

The study researched for 12 utilization influencing factors for the "Agrahara" scheme and 4 were knowledge factors. More than 20% of never claimed respondents agreed upon three factors. Those were "I don't know about "Agrahara" benefit categories" (26.25%), "I don't know about Agrahara" (25%) and "I don't know how to claim" (22.5%) were awareness related influencing factors. Unawareness of the terms and conditions of the insurance policy [12][13], Unclear policy coverage in "Agrahara" scheme [14] and understanding of the concept of social insurance was poor in many people. Especially among the low educated group (Normand & Weber, 2009) there were supportive evidence for the less awareness. The finding of 30% of the employees who claimed for spectacles had government hospital admission and not claimed [14] for it also may be due to poor awareness of benefit types. However, the study reveals that overall knowledge on benefit types were poor as average 10.0% of benefit types were known to a respondent and 91.3% interviewers suggested conducting an awareness program to improve utilization. Also, the NITF officers were not satisfied with the public sector awareness level and they have taken initiatives to overcome knowledge barrier. They have appointed coordinator for each divisional secretary office, initiated communication tools to reduce communication and knowledge gaps.

CONCLUSIONS

The study has revealed that health insurance penetration was very low among the study group unless for the "Agrahara" Medical Insurance Scheme and overall Knowledge on benefit recipients was not satisfactory. Their knowledge was not dynamic with the policy features, new initiatives and benefit types which needing high cost medical interventions. Knowledge was good with only few benefit types including Private hospital admissions, Government hospital admissions and Spectacles cover which is not causing

catastrophic health expense. “I don’t know about “Agrahara” benefit categories”, “I don’t know about Agrahara” and “I don’t know how to claim” were the leading influencing factors for knowledge.

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Technical Efficiency of Improved and Traditional Wheat Varieties in Paktia, Afghanistan: A Comparative Stochastic Frontier Production Function Analysis

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DOI: 10.29322/IJSRP.10.09.2020.p105112

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p105112>

Abstract

Afghanistan is an agrarian country and agriculture is the mainstay of national economy and rural livelihood. Majority of the farmers are engaged in subsistence farming and wheat is their main producing cereal crop. This study assessed the potential factors affecting low wheat productivity and large yield gaps in different production systems using a comparative stochastic frontier production function model. The study is documented on cross-sectional data of 235 randomly selected wheat growers in Ahmad Aba and Said Karam district of Paktia, Afghanistan. The result indicates a wide range of variation in the technical efficiencies (0.3-0.9) across the observations. Nevertheless, the difference in mean TE between the two groups is statistically significant. Evidently, the improved wheat varieties users are more technically efficient (78%) in comparison to that of the traditional ones (72%). Moreover, the gamma score shows that the differences between observed and potential frontier production are primarily due to the managerial variables that include age, education, gender, household size, extension visits, and land quality. Hence, the potential yield gap can be reduced using improved wheat variety, furthermore enhancing productivity within traditional varieties prerequisites the adoption of new technology as the level of output approached the production frontier.

Key Terms: Technical efficiency, stochastic frontier, wheat varieties, Afghanistan

1. Introduction

Although agriculture is the mainstay of the national economy and primary source of food and income generation for rural households in many developing countries, its contribution to self-sufficiency and poverty alleviation is minimal. Afghanistan is a landlocked developing country, where about 80% of the households are directly relying on agriculture. Wheat is the major producing cereal crop in the country; although the country's food production has been hovering between 2.6 and 5.2 million tons in the former decade, the massive gap between domestic production and consumption has made imports indispensable to feed its 35 million populations (Tajiv Sharma and Mahboobullah Nang, 2018). Due to the opportunistic behaviors of main trading neighbor countries, the domestic food supply is continuously at risk, hence the government realized that the food supply problem hinges on enhancing crop productivity through introducing new production inputs, mainly fertilizer, and improved seeds varieties.

In the last one and half decade, wheat production has been growing at 7.3% per annum driven primarily by the introduction of highly productive varieties and improved production input efficiency (Srinivas T., *et al.*, 2017). Moreover, wheat is cultivated under both irrigated and rainfed conditions in the country. 52% of the total wheat area is allocated to irrigated wheat cultivation, contributing to 91% of the total wheat production (3.07 mt); on the other hand, 48% of the cultivatable land is covered by rainfed wheat amounting

to only 9% of the total wheat production (0.3 mt) (Srinivas T., *et al.*, 2017). Moreover, the adoption of improved wheat varieties and associated technology is presumed to be a cause of variation in the wheat productivity across the country. Empirical results of various regional studies demonstrate that low yielding cultivars are the main reason for low wheat productivity in South Asia (Ortiz Ferrara *et al.*, 2007; Rizvi *et al.*, 2012; Srinivas *et al.*, 2010; Thapa *et al.*, 2009). Also, Omobowale *et al.*, (2009) study reveals that low level of improved input endowment is the major cause of low productivity in agriculture.

In 2019, the domestic wheat production was 4.89 million tons, where the average wheat productivity was 1,930 kg per ha (CSIA, 2019). It is indicating that wheat productivity is substantially lower throughout the county in comparison to that of the neighboring nations. Hence, farm specific efficiency analysis provides essential insights into growers' potential to improve agricultural yield. Nevertheless, estimating farm-specific efficiency has been a subject of consideration to various empirical studies in the former decades (Coelli *et al.*, 2002; Alene & Hassan 2006; Haji 2007; Ndlovu *et al.*, 2014). Majority of the previous researches have been carried out on efficiency estimation rather than making the potential comparison between the technological differences employed in the production process. Therefore, this study aims to assess the current status of TE and determines the factors that limit the level of TE of improved wheat varieties (IWV) users and traditional wheat varieties (TWV) users, in the Southeast of Afghanistan.

2. Study area, data and descriptive statistics

This study is documented on cross-sectional household-level data. A two-stage random sampling procedure is used to collect primary data for Ahmad Aba and Said Karam districts of Paktia Province, 2020. The study area is chosen for its appropriate soil conditions, high frequency of wheat cultivation, and higher awareness level of farmers from the modern agricultural technology perspective. Consequently, five villages have been selected from each district, and a well-structured questionnaire

is used to collect the relevant information to measure TE for improved and traditional wheat growers separately. Nevertheless, 95 improved wheat seeds users and 140 traditional wheat seeds users are selected to sum up a total of 135 respondents in the study area. It is worth noticing, that the field survey has been covered production attributes, socio-economic factors, and farm-specific variables.

Table 1 specifies the study data that has been used in estimating the stochastic frontier production function and technical inefficiency model. The result shows that average output under improved wheat varieties production function is 1235.79 kg, this amount of output is produced with 0.46 ha of land, 9.88 man-day labor, 54.16 kg of seed, 29.43 kg of fertilizer, 2.83 liters of agro-chemical, and 8471.52 AFN of equipment capital. Nevertheless, the average difference in output and inputs is in favor of the null hypothesis inferring that the mean difference in output and inputs are not statistically significant between the two groups of study.

The descriptive result reveals that sampled farmers are middle-aged, where the average age for improved and traditional seeds users is 42 and 44 years old, respectively. Also, the majority of farming households are male-headed. Also, the result reveals that the sampled farmers have low education levels, whereas the improved seeds users have more years of schooling compared to that of the traditional ones, and the mean disparity between the two groups is statistically significant at 1% alpha level. It is implying that education has assisted farmers to adopt IWV.

Also, the average household size is significantly varying between the two groups. Thereby, smaller households are more likely to adopt IWV, and it can infer that most of the larger households are growing wheat for subsistence purposes, hence they are risk-averse in adopting new technology. Also, it is evident from the descriptive statistics that on average, 49% of the improved seed users have accessed extension visits, which is significantly higher compared to 19% of the traditional ones. The result is concluding that technical knowledge is a prerequisite for the successful adoption of seeds technology.

Table 1: Descriptive statistics and variables description used in SFA and inefficiency model

Variable	Variables Description	Traditional (140)		Improved (95)		Difference	p-value
		Mean	SD	Mean	SD		
Production function variables (135)							
Output	Total wheat production of a farm (kg)	1235.79	572.65	1214.43	582.10	21.36	0.680
Land	Farm size under wheat cultivation (ha)	0.46	0.16	0.46	0.16	0.00	0.822
Labor	Total number of labor (man day/ha)	9.88	6.14	9.77	5.97	0.11	0.837
Seed	Amount of wheat seeds applied (kg/ha)	54.16	29.01	54.86	29.41	-0.70	0.782
Fertilizer	Amount of fertilizer applied into wheat (kg/ha)	29.43	26.53	30.33	27.16	-0.90	0.698
Chemical	Amount of agro-chemical applied (lit/ha)	2.83	5.06	3.09	5.02	-0.26	0.555
Equipment	Equipment purchased for wheat growing ^a	8471.52	6084.89	8616.6	6496.89	-145.13	0.790
Technical efficiency model variables (135)							
Age	Age of the household head (year)	44.54	30.05	42.73	14.22	1.81	0.405
Education	Number of years of schooling	1.86	3.07	3.10	3.87	-1.24	0.000***
Gender	1 if farmer is male, 0 otherwise	0.72	0.45	0.71	0.45	0.01	0.919
HH size	Number of persons living in a family	25.90	11.93	23.93	12.04	1.97	0.045**
Off- farm Income	Income earned from non-agricultural sources (AFN)	1161.86	428.78	1190.30	438.40	-28.44	0.477
Member	1 if farmer is cooperative member, 0 otherwise	0.36	0.48	0.35	0.48	0.01	0.773
Extension	1 if farmer access extension, 0 otherwise	0.19	0.39	0.42	0.49	-0.23	0.000***
land plots fragments	Number of plots allocated for wheat cultivation	2.25	1.05	2.24	1.03	0.01	0.930
Land Quality	Land response to yield on Likert-scale from 1 to 5 (1 is best, and 5 is worst)	2.64	1.36	3.00	1.25	-0.36	0.003**

* **, *** Significance at 10%, 5%, and 1% alpha level.

Source: authors' survey, 2020

Note: all value of the variable used in the CDPF are documented here as actual value before the logarithmic transformation.

^a Monetary value are in Afghanistan local currency (AFN), the national currency, where 1 USD equivalent to 76 AFN in 2020.

3. Analytical tools

3.1. Stochastic frontier analysis

The stochastic frontier production function was used to analyze technical efficiency for the two groups of IWV and TWV separately. In this study, the stochastic frontier production function is used which is developed by AIGNER, *et al.*, (1977), the general structure of the equation for a cross-sectional model is given as follows.

$$Y_i = f(X_i, \beta) \text{Exp}(V_i - U_i), i = 1, \dots, N \quad (1)$$

Where, Y_i indicates the yield produced on the i^{th} plot, X_i reveals a vector of production inputs employed on the i^{th} pattern, and β is a vector of unknown parameters to be

estimated. V_i indicates the random component and pertaining all the factors that are out of the farming household control. Finally, U_i indicates a random variable pertaining technical inefficiency in the production process, and U_i has an independent and normal distribution, $\sigma_v^2 (|N(\mu_i, \sigma_u^2)|)$, where

$$\mu_i = \delta_0 + \sum_{m=1}^N \delta_{mi} Z_{mi} \quad (2)$$

Here, Z indicates a vector of farm-related characteristics that influences production inefficiency, and δ_i presents the study parameters to be estimated.

The SPF analysis is carried out for the maximum attainable output. The general structure of the model is given as follows.

$$TE = \text{Exp}\left[\frac{E(u)}{\varepsilon}\right] \quad (3)$$

Here, TE refers to the potential of a farmer that could produce relative to maximum output given a particular amount of inputs and production technology. This approach has been used by various empirical studies to estimate technical efficiency and analyze the factors affecting the inefficiency of farmers (Gimbol *et al.*, 1995; Abrar Suleiman, 1995; Getu Hailu, *et al.*, 1998; Aigner *et al.*, 1977; Bakucs *et al.*, 2014; Battese and Corra, 1977; Elrashid *et al.*, 2013; Farrell, 1957; Ferit, 2013; Kalirajan and Shand, 1989; Kutala, 1993; Meeusen and Van Den Broeck, 1977; Parikh and Shah, 1994; Reddy and Sen, 2004; Sharma and Datta, 1997; Taylor and Shonkwiler, 1986).

Aigner *et al.*, (1977) has been used a stochastic frontier approach, and arguing that the noise term has two elements, $\varepsilon_i = v_i + u_i$. Where, v_i represents the uncontrollable symmetrical disturbance, such as measurement errors, probable shock, and statistical error. Though, v_i is assumed to be independently distributed as $v_i \sim N(0, \sigma^2)$. On the other hand, u_i is a non-negative error term representing the technical inefficiency of the farmers, and assumed to be independent of v_i . Moreover, as mentioned u_i is a non-negative error component, inferring that the output of each observation ought to be situated on or below the production frontier (Battese and Broca, 1997). Nonetheless, variance terms given in the estimation of the stochastic production frontier model are clearly defined as bellow in equation (4) and equation (5).

$$\sigma^2 = \sigma_u^2 + \sigma_v^2 \quad (4)$$

$$\gamma = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_v^2} \quad (5)$$

It is worth noticing that equation (1) defines only the availability of inefficiency, while rest of the empirical modeling is not specified. Hence, in most of the empirical studies two distinctive approaches have been used to estimate the stochastic frontier production model, that include two-steps SF estimation, and single-step SF estimation approach. In the

former one, the initial step is to estimate the stochastic production frontier in order to predict farm level technical inefficiency using Equation (1). In the second stage, a regression analysis is conducted employing Equation (2). Nevertheless, the two-steps estimation is associated with serious problems (BATTESE AND COELLI, 1995; KUMBHAKAR *et al.*, 1991). Some of the problem arising from two-steps estimation that includes the probability of correlation between inputs and technical inefficiency; moreover, as the technical inefficiency is one-sided, hence OLS estimation might not be reasonable; in addition, as the inefficiency (u_i) estimates should be non-negative, thereby in the second step the interpretation of the residual term is imprecise (KUMBHAKAR *et al.*, 1991). Eventually, in this study we used a direct or single-step approach to estimate stochastic production frontier and inefficiency models, simultaneously. In this approach, the exogenous factors influencing technical inefficiency are incorporated directly into the PF, where it is specified as follows.

$$Y_i = f(X_i, Z_i, \beta) \exp(V_i - U_i) \quad (6)$$

It is evident from the above Equation (6), that the variables are categorized into two distinctive clusters: the production inputs related variables (X_i), and the inefficiency attributes (Z_i).

3.2. Empirical study models

The parameters of SF production function (equation 1), and the attributes of technical inefficiency (equation 2) are estimated simultaneously with the Maximum-Likelihood Estimation (MLE) employing the statistical package Frontier 4.1 (COELLI, 1996). The general form of translog production function is identified as:

$$\ln(Y_i) = \beta_0 + \sum_{k=1} \beta_k \ln(X_{ik}) + \frac{1}{2} \sum_{k=1} \sum_{j=1} \gamma_{jk} \ln(X_{ij}) \ln(X_{ik}) - U_i + V_i \quad (7)$$

$$U_i = Z_i \delta + \omega_i \quad (8)$$

Where, Y_i is the logarithm of the value of output, X_i presents the logarithm of the value of production function inputs. The inefficiency attributes are presented by Z_i (the description of study variables is given in the preceding Table 1).

4. Result and discussion

The Cobb-Douglas stochastic frontier and technical inefficiency models are estimated jointly, and the results are presented in Table 2. The stochastic production frontier estimates indicate that all of the explanatory variables are directly related to the output and statistically significant under the improved wheat varieties model. On the traditional model side, land, labor, seeds, fertilizer, chemical and equipment are found to be positive and significant, while agrochemical are inversely related to wheat production. The negative coefficient of the chemical is indicating that its response to yield is poor in the study area. Perhaps the growers use improperly or overdoses of the chemical, hence the production is adversely affected by it.

Furthermore, return to scale documents economies of scale (for both categories), it is denoting that the duplication of output per acre would need less than doubling of the production inputs; implying that currently, farmers are inefficient in resource utilization, hence the production can be enhanced with more proper use of current resources and technology. Moreover, gamma γ (ratio of the variance of technical efficiency to the total variance of output) measures the contribution of the noise with respect to the model errors. Gamma value for improved and traditional model is estimated at 0.79 and 0.84, respectively; it is indicating that 79% and 84% of the difference between the observed and frontier yield is primarily due to the management of available resources.

Table 2: Maximum likelihood estimates of the stochastic production frontier and technical inefficiency model for improved and local wheat varieties

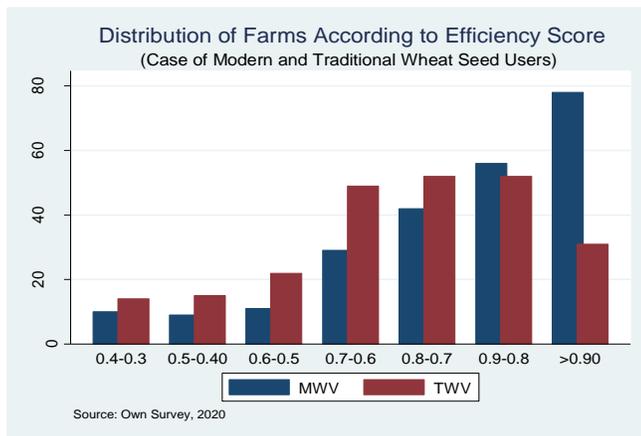
Variable	Parameter	IWV			TWV		
		Coefficient	Standard-error	t-ratio	Coefficient	Standard-error	t-ratio
SF function estimates							
Output		7.67	0.24	31.96***	7.41	0.04	185.25***
Land	β_1	1.23	0.04	30.75***	1.18	0.02	59.00***
Labor	β_2	0.17	0.02	8.50***	0.19	0.01	19.00***
Seed	β_3	0.01	0.02	0.50***	0.03	0.01	3.00***
Fertilizer	β_4	0.001	0.001	1.00***	0.001	0.001	1.00**
Chemical	β_5	0.001	0.001	1.00***	-0.001	0.001	-1.00***
Equipment	β_6	0.04	0.02	2.00***	0.05	0.01	5.00**
Inefficiency estimates							
Age	δ_1	-0.02	0.01	-2.00***	-0.02	0.00	-10.38**
Education	δ_2	-0.20	0.05	-4.00***	-0.12	0.06	-1.99**
Gender	δ_3	0.15	0.14	1.07**	0.33	0.31	1.07
Household size	δ_4	-0.01	0.01	-1.00**	0.03	0.01	2.52**
Off-farm income	δ_5	0.00	0.00	-0.07	0.00	0.00	2.12
Cooperative membership	δ_6	-0.16	0.32	-0.49**	0.23	0.19	1.21
Extension	δ_7	-0.53	0.25	-2.12**	-0.65	0.42	-1.54**
Fragmentation	δ_8	0.16	0.06	2.67**	-0.05	0.14	-0.33
Land quality	δ_9	0.22	0.07	3.14***	0.79	0.22	3.61**
Variance parameters							
Sigma-squared	σ^2	0.30	0.05	6.00	1.83	0.50	3.69
Gamma	γ		0.79			0.84	
Log-likelihood function			42.40			-13.42	
Mean technical efficiency			0.78			0.72	

Note: ***, ** and * are indicating ($p < 0.01$), ($p < 0.05$) and ($p < 0.01$), respectively.

Source: Author's Field Survey, 2020

4.1. Technical efficiency

Table 3 summarize average technical efficiency and the potential output that can be obtained by enhancing the technical efficiency level using the current production inputs and technology. The result shows that TE is ranging from the lowest of 32% to the highest of 96% in the study area. The mean technical efficiency index for IWV and TWV is found to be roughly 78%, and 71%, respectively. Also, the study findings are consistent with that of our pre-expectation that IWV is technically more efficient.



Njeebullah Tota Khail (2016) conducted a study who has documented the mean technical efficiency for wheat farmer 64% in Paktia, Afghanistan. The study result is implying that on average the improved and traditional farmers are operating only 22%, and 29% below the production frontier, respectively. In spite of the moderate TE level, there is still more room for enhancing the technical efficiency of farms, whereas per hectare the potential output can be increased by 348.6 kg for IWV and 342.5 kg for TWV without additional inputs through more efficient use of current resources and technology.

Table 3. Characteristics of TE between improved and traditional models

Efficiency characteristics	IWV	TWV	Difference
Average TE (%)	0.78	0.71	0.07***
Maximum TE (%)	0.96	0.95	0.01
Minimum TE (%)	0.32	0.35	-0.03
Actual average output (kg/ha)	1,235.8	1,214.4	21.4
Potential output (kg/ha)	1,584.4	1,556.9	27.4
Potential increment in output (kg/ha)	348.6	342.5	6.03

Source: Study data, 2020

In figure 1, we provide a comparable frequency distribution of farms according to their technical efficiency scores. Clearly it can be observed that about 78 of improved and only 31 of traditional growers are operating above 90% efficiency level. Also, about 29 of traditional and a higher proportion (49) of improved wheat farmers are ranged between 0.7 and 0.6 TE level. As a whole, the result is concluding that a considerably higher percentage of improved seeds users are approaching closer to the production efficiency frontier compared to that of the traditional seeds users.

4.2. Technical inefficiency

Age is used as a proxy for learning-by-doing and farmers' experience in wheat-growing. Furthermore, the result is in favor of the alternative hypotheses that there is an indirect relationship between inefficiency and age of household head. Obviously, as the age of farmers' increases inefficiency diminishes, but up to a certain point of age, after that inefficiency and age are directly related to each other. The study result is in line with Msuya, Hisano and Nariv (2008); Shafiq and Rehman (2000); and Amos (2007) stating that as farmers grew older, they gain more experience and leads to being more efficient in farming.

With respect to the household size, the coefficient is negative and significant only for MWV, while it is contrasting in its effects regarding the TWV model. The result is indicating that households with fewer members are more technically efficient than those with more members in growing TWV, possibly because, larger families exert pressure on the limited cash resources accessible to the farming household. The result is consistent with the findings of Mango *et al.*, (2015) stating that household size has a negative effect on farmers' TE.

The coefficient of membership in cooperative is negative and significant for improved wheat farmers, whereas it is positive and non-significant under the improved seeds model. The negative effects of the agricultural cooperative on technical inefficiency suggest that farmers involved in farmers' groups are more efficient than the non-member. Probably, those farmers who has membership in agricultural cooperatives are more likely to receive valid information regarding efficiency-enhancing

technologies via farmer networks. The study finding is in line with Tessema *et al.*, 2016, stating that well-functioning farmer networks enhance technology diffusion among farming communities and lead to obtaining higher TE.

We found a similar result with Sibiko (2012); Olarinde (2011); Obwona (2000); Seyoum, Battese and Fleming (1998) that extension services have a negative and significant influence on technical inefficiency for both study cases. Idiong (2007) also observed a similar result, and asserting that the informal teaching and learning process contributes to farmers in upgrading their technical knowledge, therefore positively impacts their production efficiency. On the other hand, various empirical studies have documented that access to extension does not influence farmer technical inefficiency significantly (Omondi and Shikuku 2013; Oladimeji and Abdulsalam, 2013; Alemu *et al.* 2009).

The coefficient of land quality highlights that the estimate is inversely related to technical inefficiency for both study models. The result is necessitating appropriate land quality to get maximum output with current production inputs and technology. On the other hand, having fertile soil, and not getting the full benefit out of it is negatively influencing technical efficiency.

5. Conclusion

The study used a single-step estimation of stochastic production frontier and inefficiency models, simultaneously. Moreover, a comparison is made between improved and traditional wheat farms in the two districts of Paktia, Afghanistan. The mean technical efficiency is found to be 78% and 71% for improved and traditional wheat varieties farmers, respectively. Hence, the potential to increase production by improving technical efficiency is roughly 345 kg per hectare. Nonetheless, the difference in mean technical efficiency between the two models is statistically significant. Whereas, the improved seeds users are more likely to be closer to the production frontier. Moreover, on average inputs response to yield is higher (more elastic) in the improved model in comparison to that of traditional ones. The result is implying that modern seeds shifts the production frontier outwards in the study area. Besides, return to scale is

increasing for both scenarios, hence doubling the inputs can give more than double of the production. The required interventions for enhancing production efficiency in the study area, that includes: provision of training for farmers to improve their skills, on-field agronomical practices and water management. Moreover, an increase in output by enhancing efficiency is limited for traditional farmers in comparison to that of the modern farmers. Hence, the adoption of improved seed varieties may push the production frontier upward, whereas a good combination with other inputs is expected. Eventually, in the future further studies can be carried out on scale and cost efficiencies in the study area, to provide more comprehensive implications for policymakers and other relevant stakeholders.

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To Drive The Vehicle Using Electromechanical Actuator

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DOI: 10.29322/IJSRP.10.09.2020.p105113

<http://dx.doi.org/10.29322/IJSRP.10.09.2020.p105113>

Abstract- It is always a major challenge for the disabled people to drive the car the especially four-wheeler. So, Being able to drive car is always grateful step for people with disabilities, but the conventional driving system installed in car it is not suitable for disabled driver to drive the vehicle. People with lower limbs disabilities cannot operate breaks, acceleration controls. Disabled people who are physically unfit always face some difficulty when it comes to driving. This paper presents the evolution of new driving system by using Arduino board and electromechanical actuator for a disabled driver. In this modification was made to exiting conventional system by using Arduino programming and hand operated Mechanisms for breaking and acceleration system.

Index Terms- Actuator, Arduino Board, Battery, Switches etc.

I. INTRODUCTION

Driving the motor vehicles four wheeler is the big challenge for physically disabled people, especially paraplegic people. The paraplegic need to have mobility. However they are completely dependent on other people to travel or commute. This project aims to enable paraplegics to safely drive and operate an automatic transmission as per census 2011, in India. Out of the 121 crore population about 2.68 crore persons are 'disabled' which is 2.21% of total population. Among the disabled population 56% (1.5cr) are male and 44% (1.8cr) are females. In the total population the male and female population is 51% and 49% respectively. In India 20% of the disabled persons are having disability in movement 16% of disabled population is in the age group 20-29 years and 13% of them are in the age of 30-39 years. Disabled people who are physically incapacitated always face some difficulty at the time of driving for conventional car such as accelerator, brake pedals are usually foot operated.

People with lower limbs disabilities cannot operate such foot controls. There are numerous technologies has been introduced to accommodate different type of disability. This includes:-

- Hand control to operate the acceleration and brake.
- People lifts, wheelchair hoists
- safety belts, seat belts and harnesses

The present work is aimed at adapting a conventional vehicle's driving system for use by people with lower body disabilities. The adaptations that have to be taken into consideration are hand controls to be fitted in a car with automatic

transmission and power steering. There are many different systems that have been reported in the literature for a vehicle designed for drivers with lower body disabilities.

Brief description of this systems are given below

MPD 3500KX Offset Hand

Control produced by company named HDS Specialty Vehicles from USA is one of the designs for drivers with lower body disabilities. In this design both the acceleration and brakes are hand controlled. As such, the driver is forced to drive with just one hand and hence it is difficult to control the steering wheel especially during cornering or high speed.

Guido-Simplex Hand-Control Guido-Simplex hand control's design uses hand accelerator ring to replace the pedal. The hand accelerator is a ring that fits just inside and slightly rises over the steering wheel. The ring can be depressed by the thumb or palm of the hand to activate the accelerator whilst holding the steering wheel in any position. The hand brake operates by way of a handle situated behind and to the side of the steering wheel and can be placed on either side, according to personal preference. The design provides the disabled driver with complete hands-on control from the steering wheel. But although the driver can put both hands on the wheel, it may still be difficult especially during the cornering to control the ring and brake and at the same time rotating the steering wheel.

Existing systems reveals that the disabled drivers are put into trial by forcing them to drive with one hand, which is quiet dangerous. Moreover, most control device used by physical handicapped drivers especially people with lower limbs disability are difficult to install and must be carefully adjusted to provide satisfactory performance. Therefore the main objective of this work is to develop a new system, in a way to modify the existing conventional car driving system so that a person with lower limbs disability can drive safely with minimum cost.

This system majorly includes a liner actuator which would thereafter give the suitable force needed to the accelerator and brake pedal with the help of switches that would be placed at the level of steering wheel which will definitely be suitable of the people with lower limb disability to operate a vehicle with both hands. In this system the linear electromechanical actuator would be used and programmed by Arduino Uno board. The brief description of the system is provided thereafter.

BASIC WORKING OF THE VEHICLE:

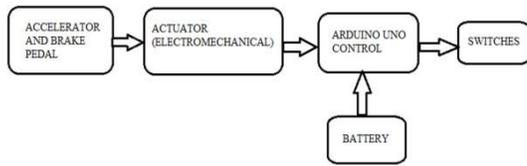


Fig 1: Block diagram of the system.

The vehicle system that is designed for people with lower limb disability consist mainly of following parts

- Accelerator and brake pedal (present in the vehicle itself but is regulated by the actuator)
- Electromechanical Actuator
- Arduino Uno controller
- Switches
- Battery, let's have a look at all the parts briefly

II. ACCELERATOR AND BRAKE PEDALS

The **Accelerator** is worked by the right foot. It is linked to the carburetor, which supplies the correct mixture of air and petrol which runs the engine, thereby controlling the power output of the engine. The further the pedal is pressed down, the greater the power output and the faster the car goes. When you let the pedal up, or take your foot off altogether, the opposite happens and the car begins to slow down. The accelerator pedal is very sensitive and new drivers usually find it difficult to get just the right amount of pressure on it.

The **Brake** pedal is placed immediately to the left of the accelerator and should be worked with the ball of the foot. Training in using the brake pedal include not only the application of the brake, but also practice in moving the right foot freely and accurately from the accelerator to the brake and back again without looking down at the pedals. This can be practiced while sitting in the driving seat without the engine running. Under normal driving conditions, only this brake should be used. The harder the pedal is pushed down, the greater the braking effect and the more quickly the car will lose speed. In most situations, only light pedal pressure is needed to brake safely and smooth.

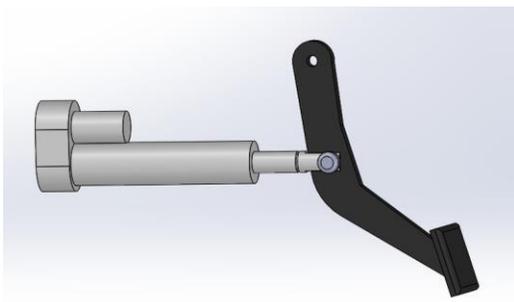


Fig 2. brake pedal

1. Electromechanical Actuator

As seen before an electromechanical actuator is a device which converts the electrical energy into the mechanical motion, here two electromechanical actuators are placed in front of the accelerator and brake pedals and operates them. The motor motion is mechanically converted to linear displacement. The design of actuator consists of the lead screw and the nut. The basic principle of operation in most of electromechanical actuator is based on the inclined plane concept. The threads of the lead screw are used as a ramp that transforms a small rotational force by magnifying it over a long distance to enable a large load to be moved over a short distance.

Fig 3: Electromechanical Actuator



Why electromechanical actuator?

Electromechanical actuator is selected as it has many advantages over the other types of actuators such as

- If one uses hydraulic actuator there is always a chance of oil leakage
- The use of hydraulic actuator will increase the storage space for vehicle i.e. the space would be required for the oil reservoirs.
- If we use pneumatic actuator the load capacity would be less that it won't fulfill the load requirements.
- In pneumatic actuators there will always be chances of air leakage which would intently break the whole system
- In pneumatic actuators the need of more storage space for compressor will be required also there will be need of lubrication.
- Also electromechanical actuators improve machine performance owing to their accurate and smooth delivery of force.
- Easy set up and installation, they save more than 50% of running costs.
- Electro-mechanical actuators possess high speed and acceleration capabilities with excellent load bearing capacity
- They are designed ruggedly utilizing the best of raw materials to can be run continuously without affecting performance.
- Risk of contaminating the environment is minimal as there are no hydraulic fluid leaks.
- They guarantee quieter operation compared to their counterparts such as pneumatic and hydraulic actuators.

2. Arduino Uno Controller

Arduino is an open-source electronics platform based on easy-to-use hardware and software. [Arduino boards](#) are generally used to read inputs and turn it into an output. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. This is done by the [Arduino programming language](#) (based on [Wiring](#)), and the [Arduino Software \(IDE\)](#), based on [Processing](#). This arduino uno controls the motion and load of the actuators by sensing the amount of pressure that is to be given to the accelerator and brake pedals.



Fig 5. Steering wheel with switches.

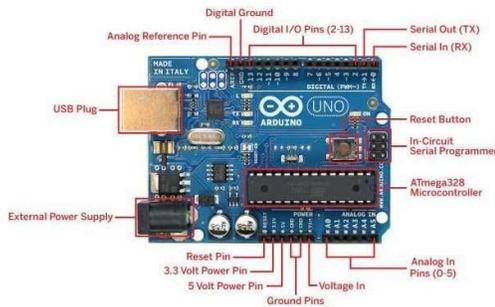


Fig 4: Arduino Uno Controller

This arduino uno gives controls to the actuator by programming the proper sequence of the load or the pressure by sensing the input. Here the input to the arduino is the load or the pressure given to the switches to drive the vehicle and the programming done on the octave software gives direction of operation and the output delivered is the proper amount of motion to process the actuator which further operates the accelerator and brake pedal.

Arduino uno controller is easy to use software and hardware controller also the libraries of the board are easily available, also it provides simple and clear programming environment which makes it easy to adapt.

3. Switches

A [switch](#) operated by the motion of a machine part or presence of an object. They are used for controlling machinery as part of a [control system](#), as a safety [interlocks](#), or to count objects passing a point. A switch is an electromechanical device that consists of an actuator mechanically linked to a set of contacts. When an object comes into contact with the actuator, the device operates the contacts to make or break an electrical connection.

These were the main parts of the system modification; this modification includes operation of accelerator and brake pedal by the electromechanical actuator. The electromechanical actuator with the help of the lead screw and nut operates the pedals by the input the sensed by the arduino uno controller which is programmed by octave to sense the amount of the pressure that is given by the driver on the switches. The greater the pressure applied so would be the speed of the vehicle.

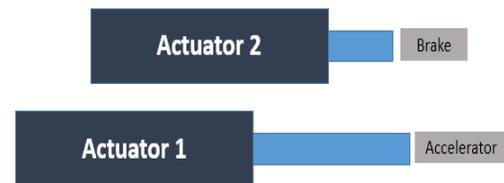


Fig 6: Two actuator system

The switches that will be sensing the amount of pressure will be placed at the steering level which can be easily operated by the people with lower limb disability without using their hands. This system also makes the vehicle fully automated.

III. CONCLUSION

This paper presents the system which is useful for the people with lower limb disability, since we all know it is very much difficult for people with disability to drive the vehicle, this vehicle gives an accomplishment for such people to be free and drive by themselves. This system majorly consists only a single difference than that of the conventional vehicle, i.e. the actuators are placed to operate the accelerator and brake pedal. This is done by the control of the arduino uno which senses the amount of the pressure that is to be given to the accelerator or brake pedal in order to run the vehicle. The arduino uno is directed by proper programming to take the actions; this programming is done by the octave software. This system enhances the fully atomization of the vehicle with low costs and low maintenance providing high accuracy and efficiency. It is not that only physically disabled people can use this vehicle, it can rather be used by every person who is also physically fit by taking proper training.

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