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Contact Information:

Editor: editor@ijsrp.org

Website: <http://www.ijsrp.org>

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A Critical Analysis of the Potential of Photovoltaic (PV) Modules as Design Elements. a Case of Selected Kampala Hotels, Uganda

Kalyango Ssenabulya James^{*}, Kenneth Ssemwogerere^{**}

^{*} Graduate Architect & Former Student, Department of Architecture & Physical planning, School of Built Environment, College of Engineering, Design, Art and Technology, Makerere University, Kampala, Uganda

^{**} Practicing Architect & Lecturer, Department of Architecture & Physical planning, School of Built Environment, College of Engineering, Design, Art and Technology, Makerere University, Kampala, Uganda

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Abstract- Traditionally, Photovoltaic (PV) modules have been perceived as technical devices other than design elements, often integrated onto building envelopes in more often than not as a non-aesthetical component thereby appearing as afterthoughts. This in the end compromises a building's design aesthetics while in pursue of green and clean energy. Furthermore in Uganda, the energy costs of operating facilities especially large building portfolios such as hotels, shopping malls and arcades are consistently rising due to the high rate of growth of demand for electricity. Despite the high influx of PV systems in Uganda, PVs are not being utilized beyond their accustomed norm of generating electricity energy. The study therefore investigates the potential use of PV modules as building design elements with specific reference to selected in the Capital City of Uganda, Kampala. The research gives a theoretical understanding of the different ways in which PV modules can be applied to enhance a building's design aesthetics as well as the major factors that affect their integration as design elements. A total of four case studies and field surveys furnished the research with useful and consistent analyzable results. The study reveals that the architectural integration of PV modules is feasible and that the site contexts, marketability and design character of the hotels allow for PV integration as design elements and can be used to offset the short term economic disadvantages of this technology.

Index Terms- Photovoltaic, Modules, design elements, Uganda

I. INTRODUCTION

Photovoltaic or PV can be defined as that pertaining to the generation of electricity when radiant energy falls on the boundary between dissimilar substances, two different semiconductors. (Merriam-Webster 2013) whereas Module are the PV cells combined to form modules, which give the system the flexibility to be expanded or reduced to suit any given application. (Basnet 2012) The concept of using photovoltaic modules to generate electricity has existed for quite a long time. Apart from their accustomed norm of providing electrical power, these devices can also be used as building and landscape design features such as roof covers, facade finishes, glass panels or sun

screening devices. In other words, PV modules pose great potential to the built environment due to their dual functionality. Claas Helmke (2001, p.1) points out the three categories of building integrated PV modules based on their physical properties and application. He further defines these categories in terms of generations, with the first generation of building integrated photovoltaic systems consisting of PV modules mounted onto private or commercial buildings using custom-made substructures and fixtures, these being the most commonly applied systems in Uganda. Second generation PV systems are characterized by PV modules that replace parts of the building envelope while the third generation systems are classified by flexible photovoltaic laminates (Helmke 2001, p.3).

The use of PV modules is increasingly becoming popular within Uganda's built environment but there is no significant evidence to show that they have been fully utilized to complement building design aesthetics. Regional practice strongly depicts the installation of photovoltaic panels onto flat and inclined roof systems. This is more common in areas near the equatorial region where the sun's position is usually high all-around the year (Basnet2012, p.16). Whereas there have been a number of studies on photovoltaics in architectural design, there has not been any study to assess their potential use as building design elements in Kampala.

II. OBJECTIVES

The prime goal of this research is to analyze the potential use of PV modules as building design elements with specific reference to selected Kampala hotels. The specific objectives included; to identify the factors affecting the use of PV modules as design elements; to reveal ways of how PV modules can be used to articulate building aesthetics; to discuss the benefits of the architectural integration of PV modules; to assess the challenges of using PV modules as design elements within Kampala hotels and finally to propose ways in which the challenges can be overcome.

III. METHODOLOGY

The research adopted the following data collection techniques: Direct Observation: Field visits to selected hotels premises within Kampala. To document the architectural character of hotel buildings using photography and sketches as tools of capturing and analyzing information.; Literature review: On how PV modules have been used to enhance building design aesthetics, factors determining their use and any other information that may prove useful to the study. These included books, reports, thesis, online articles and journals.

Interviews and Questionnaires: These were used to collect information in form of expert and personal opinions from target populations comprising of practicing architects, PV expatriates, hotel administration and the general public. The specified population groups majorly consist of stakeholders responsible for the implementation of PV modules as design elements.

IV. LITERATURE REVIEW

PV modules as design elements

The use of PV modules to articulate building facade aesthetics is a modern movement that lies within the field of architectural engineering.

According to Anne G. Hestnes (1999), PV systems when integrated in a building, become part of the general building design and also often become general building elements. This therefore implies that there may be a cost reduction factor when used to execute a function of a building component that they would have otherwise been superimposed on.

Building integrated photovoltaics refers to the concept of integrating photovoltaic elements into the building envelope, establishing a symbiotic relationship between the architectural design, functional properties and economic regenerative energy conversion (Zeeuw 2011, p.6).

From the above, it can be noted that major factors surrounding this concept are, to improve building aesthetics thus marketability of the project, a concept that integrates sustainability, social and economic issues.

PV technology has advanced with time becoming more efficient as well as taking on various forms in order to capture various architectural styles. Building integrated photovoltaic systems can be categorized into three generations, basing on Claas Helmke (2001). The generations are categorized based on the physical properties and the modes of integration of the photovoltaics.

The first generation of building integrated photovoltaic systems was the genesis of the architectural integration of PV modules. With these systems the photovoltaic generator is mounted onto an existing roof using substructures and fixtures (Helmke 2001, p.2). However, due to the mode of integration their impact on the facade appearance is questionable in terms of workmanship. They focused more on function than aesthetics.

Flexible photovoltaic laminates are categorized under the third generation of building integrated photovoltaic systems. Their flexible character enables them to take up the form of the building component onto which they are secured (Helmke 2001, p.3). With this, new fields of application can realized due to the

flexible and lightweight character of the photovoltaic laminates especially with curving building envelopes.

The above discussions reveal that there has been a transition in building integrated photovoltaic systems, each portraying a specific character and function, prompting one to ask whether Kampala's architecture is in position to comfortably embrace this transition and to what extent, with specific reference to hotel designs.

PV Module Integration Methods

In the thesis titled *Architectural Integration of Photovoltaic and Solar Thermal Collector Systems into buildings*, Arjun Basnet (2012, p.24) states that PV module integration methods can be classified into two categories, superimposed and integrated systems. The author further defines a superimposed system as where the PV system is attached over the existing building envelope while an integrated system is where the PV system forms a part of the building envelope. A system where photovoltaics form parts of the building envelope may appear as a more unified body compared to that where the photovoltaic modules are superimposed.

Types of PV Module Integration

There are three basic ways of integrating PVs in buildings, Roof-based systems, Facade systems,

Sunshades and sunscreens, based on Randall Thomas' (2001, p.23) book on *Photovoltaics and Architecture*. Depending on which part of the building they are to be integrated, the properties of the PV modules and character of the specific area of integration have to be identified.

Roof integrated PV systems involve integrating PV modules on flat roofs, inclined roofs, curved roofs and skylights. Roof based systems may be easier to integrate PVs aesthetically and functionally than a wall (Randall 2001, p.27). These could then be considered as a potential starting point for exploring design though the use of photovoltaics in Uganda.

PVs laid horizontally on the flat roofs are normally not visible from the ground and hence the significance of aesthetic part of integration can be less (Basnet 2012, p.28). This type of integration basically focuses on energy production rather than design aesthetics due to restricted views. Not much design articulations can be achieved unless the roof is looked at from a higher viewing platform.

Transparent and semi-transparent PV roof panels can be used in glass covered areas such as atriums; part glazing and part-opaque PVs (Randall 2001, p.27) transmit enough diffused sunlight to achieve a pleasant lighting level in the atrium.

Facade integrated PV systems involve integrating PV modules as cladding elements in opaque parts of the facade, transparent PV facade in almost the same way as a standard glazed facade, on inclined walls and PV modules as sunshades. Randall (2001, p.28) suggests that a facade could even consist of a combination of glazed areas for vision and opaque PV panels or have PV modules with opaque areas and transparent ones for curtain walling systems. This indicates that opaque PV modules can be superimposed onto a structural wall or fitted into the frame of a curtain walling system to create a wall plane that achieves a desired facade aesthetic.

Sun shades can take the form of a fixed or moveable system and can be installed either vertically or horizontally on the facade of a building, as posited by Basnet (2012, p.39). These can be a good option for preventing the penetration of direct sun rays into the interiors most especially on the east and west facing facades. Installation costs, skills and technology could be a factor to consider when selecting either system.

Visual aesthetics of PV designs

On the whole, PV systems that are architecturally pleasing within the context of the building, good material and colour composition, that adapt well to overall modularity, the visual aspect of the grid which is in harmony with the building and creates a satisfactory composition will result in good integration and renders high architectural quality (Roberts and Guariento 2009, P.12).

Factors influencing the use of PV modules as design elements

A study conducted by Craig Jackson and Sara J Wilkinson (2003, p.404) titled *An Evaluation of the Viability of Photovoltaics in Residential Schemes Managed by UK Registered Social Landlords* showed that 57% of the respondents felt that despite the cost factor, photovoltaics were both innovative and exciting and an energy source of the future. The findings suggest that design aesthetics can be a factor considered by a project client to offset the economic disadvantages associated with the use of PV systems. The use of PV modules as architectural design elements could therefore be looked at as a benefit when assessing the viability of their integration. This is due to the fact that visual appearance does increase the marketability of a project as such new technologies could always be used as an opportunity to create a niche market by staying one step ahead of the competition (Jackson et al 2003, p.406). Design aesthetics could therefore be established as a factor when assessing the potential use of PV modules as building design elements.

Cost is a major propriety in relation to other factors when it comes to the architectural integration of PV modules. Initial capital and maintenance cost of PV installations are categorized under cost in this discussion. A major attraction of building integrated PVs is that the cost of the elements they replace can be offset against the PV cost (Randall 2001, p.33) for example the use of integrated PV systems as cladding elements in opaque parts of the facade, transparent PV facade in almost the same way as a standard glazed façade or PVs as sunshades.

In general, costs of PV systems are higher than those of conventional cladding systems that they set out to replace. However, compromises are at times may made for the architectural aesthetics. Jackson et al (2003, p.407) study hypothesized that in order for residential social landlords to view photovoltaics as a truly viable option, costs would need to fall. The above discussion deduces cost as a determining factor to the integration of PV designs but with social issues having the potential of offsetting their economic disadvantages.

More often than not, designers view solar design as a limitation rather than an opportunity. Many architects and clients feel that solar architecture implies rigid design limitations regarding orientation, placement of windows, sloping roof elements, sun spaces and so on (Kiss Cathcart Anders Architects 1993, p.6). But for the implementation of any idea, project

clients and those responsible for the implementation must be informed of the project's potential out comes.

The size of the development program that the Registered Social Landlords in the UK managed or expected to execute had a link to the use of photovoltaics on their schemes (Jackson's et al 2003, pp.401-402). The survey revealed that the larger Registered Social Landlords had more scope to utilize new technologies and products such as photovoltaics due to their ability to have more access to research funding and undertake demonstration projects.

Randall (2001, p.28) mentions that, inclined photovoltaics can be integrated on a vertical wall to create a glazing or rain screen cladding system, but goes ahead to caution that complexity for such construction cladding increases. This reveals that architectural engineering with specific reference to the integration of PV modules calls for an understanding of design and construction techniques. Low skills and technology may therefore limit the level of PV design articulation.

V. ANALYSIS OF THE FINDINGS

The scope of the research was limited to hotel developments situated within the Kampala central business district. Kampala's central business district could possibly be termed as one of the busiest areas in Uganda and for that reason the research sought to analyze hotel developments prone to a large client base. The research had also aimed for a representative sample size of approximately eight hotels preferably those built in recent time and bearing a large capacity. However, the research was limited to four hotels as a result of the ongoing terror alerts within the country. The inability to gain in-depth data has to be recognized.

Protea hotel is located at the Kololo terrace, flanked by Acacia avenue, upper Kololo terrace and Elgon terrace road on the west, north and south respectively. Furthermore, the terrain slopes along the upper Kololo terrace and Elgon terrace road with Acacia avenue at the lowest point.

Grand imperial hotel premise is located in the heart of Kampala's central business district, on Speke road, Nakasero hill. The hotel is flanked by Shimoni road on the south, Speke road on the north-east and The Square 2 on the north-west. Situated on its western side with a height of approximately 50 meters is the East African development bank, the only adjacent landmark building that has a shading effect on the hotel's building envelope.

Metropole hotel is located on Windsor road, Kololo hill. The site is flanked by tarmac roads on the north and west facades, coupled with a row of trees along its boundary walls. The hotel building mass is orientation in such a way that the longest facades are facing the east and west direction.

Sheraton hotel is located on Kintu road at the heart of Kampala's central business district. The site is flanked by Kintu road, Speke road and Nile Avenue on the north, west and south respectively. With a storey height of 13 floors, the hotel building imposes high visual dominance on the surrounding context. Furthermore, the hilly terrain does not have a significant impact on the visual quality of the hotel building as a result of its grand height.

The architectural integration of PV modules is context dependant. Aspects such as shadowing from adjacent trees and buildings, terrain and dust intensity may have a positive or negative impact on PV designs. The character of the building features determines the type, method and properties of PV integration.

The performance of PV modules decreases with shadowing hence designs for building integrated PVs need to consider this to maintain high performance (Randall 2001, p.11). One would expect that, shadowing of the hotel buildings in the Kampala central business district would majorly arise from their adjacent buildings. This may have been true for Grand Imperial hotel however the study revealed that the major source of shadowing of hotel buildings was caused by trees though in a mild state.

Out of the four hotels that were visited, only one of them was flanked by two roads. The rest had three roads abutting their premises. The study shows that the roads created an offset distance between the hotels and adjacent buildings consequently rendering the facades free of shadowing. Height as an advantage allowed for views of Sheraton hotel from streets far beyond the hotel premises on streets such as Sezibwa and Pilkington road. In other words, it can be argued that the height of the hotel buildings coupled with the sloping terrain offer unobstructed views of the hotel facades.

The study also reveals that, despite the hotels being located on hill slopes, the flat roofs could not be seen from the ground regardless of the viewing point. Therefore, the significance of PV design aesthetics can be less or not there at all as reported in the research by Basnet (2012, p.28). On the contrary, the pitched roofs could be viewed from both within and off the hotel premises especially from the upper parts of the sites.

In summary one can say that, the vast application of pitched roofs on hotel building designs with specific reference to clay tile roof coverings pose great potential for the architectural integration of PVs on inclined roofs and integrated PV tiles.

It is apparent that some of the hotel buildings possessed 'blank' facades that facing the east and west as observed on Sheraton and Metropole hotel. Furthermore, air conditioning systems secured on the facades of Protea and Metropole hotel had a discreet effect on the surface area although Metropole hotel managed to mitigate this effect by securing them within recessions in the facade.

VI. CONCLUSION

Research reveals that PV module integration methods can be classified into two categories, superimposed and integrated systems. There are also three basic ways of integrating PVs in buildings, roof-based systems, facade systems, sunshades and sunscreens.

A comparative study of the four hotels reveals the suitability for the architectural integration of PV inclined roofs, vertical facade and sunshade systems, partially to the vivid views of the hotel building envelopes from adjacent streetscapes that flank Sheraton, Protea, Metropole and Grand Imperial hotel on the upper slopes of Nakasero and Kololo hill where they are situated. They enjoy high visual qualities without compromising security on the hotel premises. Furthermore, the vast application of visible installation free terracotta tile pitched roofs on three

hotels as opposed to the invisible installation packed flat roofs poses great potential for PV integration on inclined roofs, as a combined roof element or mounted above the roof coverings.

It is evident that the vast applications of inclined, curved and straight transparent glazing members in public spaces create opportune areas for the integration of semitransparent PV glazing known to possess a high solar radiation absorption rate. However, these integrated systems require a high level of skill and PV technologies that are currently unavailable in Uganda. The research therefore proposes that architects work closely with PV expatriates and other engineers through design consultations to be in position to design and construct buildings that incorporate such technology.

The research data confirmed that PV modules on the local market cannot effectively satisfy requirements that must be addressed by PV designs namely size, colour, cost, transparency and weather-tightness. For that reason, special orders have to be made for any hotel design that seeks to incorporate PV modules as design elements. However, PV technology will have to be affordable in capital terms before they can be seen as both a design and power production option. Cost reduction will occur if PV modules are manufactured locally, as pointed out in the research survey, where plans of establishing PV module assembly plants in Entebbe and Mbale exist. In addition, training of solar PV technicians to be in position to install complex integrated systems will result in a reduction of construction costs, as the cost of the PV modules are offset against that of the substituted elements.

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AUTHORS

First Author – Kalyango Ssenabulya James, Graduate Architect & Former Student, Department of Architecture & Physical planning, School of Built Environment, College of Engineering, Design, Art and Technology, Makerere University, Kampala, Uganda

Second Author – Kenneth Ssemwogerere, Practicing Architect & Lecturer, Department of Architecture & Physical planning, School of Built Environment, College of Engineering, Design, Art and Technology, Makerere University, Kampala, Uganda

Millennials' Health Related Practices Related Food Habits and Preferences

Oscar T. Vallejo

Researcher

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Abstract – The main purpose of the study was to promote healthy food habits and preferences among Millennials. It made use of the descriptive survey methods. Findings revealed that majority of Millennial respondents have a poor health related which includes eating junk foods, fast-foods, chicken and pork, drinking soft-drinks, not eating vegetables and less walking. They practiced unhealthy eating habits such as not eating fruits, vegetables and did not try to have healthy diet. Favorite viand, eating fruits and fast-food were highly significant with food habits. Food preferences related to health related practices show that there were highly significant relationship between vegetable preferences and favorite viand and fruit preferences and eating breakfast practices were negative significant..

Index Terms – health related practices, food habits, food preferences, Millennials

I. INTRODUCTION

Philippines is a blessed nation where foods are always available anytime and anywhere. The availability of foods among Filipinos makes us picky and diverse lifestyles. Filipinos are fun of foods; we consume at least five small-plate meals a day. Despite of being food lovers, the country is still fronting with both consequences: the malnutrition and obesity which is the catalytic effects of incorrect food preferences, and habits.

Food preference or choice investigates how people select the [food](#) they eat. It comprises psychological, sociological, economic, and sensory aspects. Factors that guide food choice include taste preference, sensory attributes, cost, availability, convenience, cognitive restraint, and cultural familiarity. In addition, environmental cues and increased portion sizes play a role in the choice and amount of foods consumed (Wikipedia).

Food habits or eating habits refers to why and how people eat, which foods they eat, and with whom they eat, as well as the ways people obtain, store, use, and discard food. Individual, social, cultural, religious, economic, environmental, and political factors all influence people's eating habits (diet.com).

Food preferences and habits are innate to every individual. We all know the pleasures are related to eating. Selecting good food is enjoyable, habit of dining with friends and family multiplies the enjoyment, this demonstrates God's goodness. As the Bible says:

“God created [food] to be received with thanksgiving by those who believe and who know the truth. ...[He]

richly provides us with everything for our enjoyment” ([1 Timothy 4:3](#); [6:17](#)).

The consequences of incorrect food preferences and habits are manifested in the issues of health. Some of us can't tolerate certain foods and we should avoid them. More often, however, we lack self-control and eat poorly or in excess, turning God's gifts into an expression of selfishness and even a means of personal suffering.

Filipino youth today as considered millennial is endangered of malpractice of foods preferences and habits. This life stage as adolescence is characterized body changes into that of an adult – thus it is essential for them to increased nutrient needed by the body. It is also a period when teenagers may decide to start dieting and skipping meals caused by peer pressure can affect their eating behaviour and result in either over-eating or under-eating which is the cause of obesity and malnutrition.

FAO figures also reportedly show that about three million (19.8 %) adolescents are underweight and chronically energy-deficient. The Filipino Times (2014).

Malnutrition and obesity are rooted by incorrect foods preferences and habits, which are the root causes of diseases, increase health risks and reduce life expectancy. Potentially fatal conditions associated with obesity include Type 2 diabetes, coronary heart disease, cancers and gall bladder disease,” reported by Senator Villar, (The Filipino Times, 2014).

“Health is wealth” a simple vital quotation we need to value. The researcher was a victim of a fatal disease caused by incorrect food preferences and habits resulted to “type 2 diabetes” which end to a very expensive and delicate operation “kidney transplant”, thus this research was realized for the advocacy and awareness on the effect of foods on health and wellness.

II. OBJECTIVES

The main purpose of the study was to determine the health related practices related to food habits and preferences of Millennials I Angelcare Science Academy in Baler, Aurora. Specifically, it sought to find-out the following:

1. Health related practices of Millennials;
2. Food habits and preferences of Millennials; and
3. Relationship of health related practices with the food habits and preferences.

III. REVIEW OF RELATED LITERATURE

The literature sought develops a Millennials' health related practices related with their food habits and preferences.

Breakfast Eating Practices. A typical Filipino breakfast is usually eggs, sunny side up; fried rice and any or all of the favorite Filipino breakfast staples: tocino or sweetened pork strips; tapa, a kind of beef jerky or tuyo, dried salted fish. These dishes are fairly easy to cook. They require only minimal cooking skills. http://www.streetdirectory.com/food_editorials/meals/br_eakfast_meals/a_typical_filipino_breakfast.html. July 8, 2018

Young and Fors (2009) stated that students consuming healthy breakfasts and healthy lunches were more likely to be White or Asian, better able to communicate with parents or guardians on serious issues, closely monitored by their parents, living with one or both parents, spending less time at home without adults, perceiving themselves at about the right weight or underweight (lunch/breakfast only), male (lunch/breakfast only), and in 9th or 10th grade (breakfast only).

Junk-foods Eating Practices. Shi, Z., et.al., (2005) found out that about 53% of the students from China were snacking while watching TV. The types of snack foods were mainly crisps, huamei (dried fruit snacks), soft drinks, and seeds (pumpkin, sun flower etc).

Drinking Soft-drink Practices. Goloso-Gubat, M.J. et.al., (2015) revealed that beverages contributed 17% and 3% to mean energy intake per day of pre-school children, and schoolchildren and adolescents, respectively.

Shi, Z.et.al., (2005) claimed that intake of soft drinks were positively and significantly associated with SES. About 10% of the boys from high SES families drink soft drinks (sodas and cola), the corresponding figures were 21.5 and 4.2% ($P<0.05$). In the lowest SES group, only one-third as many as in the highest SES group consumed soft drinks that often.

Absent/Present of Illness. NIH News in Health (2017) claimed that things you eat can influence your risk of dying from heart disease, stroke, or type 2 diabetes. The findings suggest ways to change your eating habits to improve your health.

Realbuzz (N.D) reported that our eating habits have changed dramatically in modern times. The foods we eat are far less nutritious than they appear due to intensive farming methods, pesticides, additives and preservatives. Furthermore, Health and disease are directly linked to what we eat and as all disease originates at the cellular level, healthy cells create healthy tissues, healthy organs, healthy heart and healthy skin.

Favorite Viands. Barra, L.I. (2004) claimed that Grade 1 pupils from University of the Philippines, Diliman, Quezon City have a favorite foods which included chicken, fruits, vegetables, sinigang, fish, chocolate, adobo, kalabasa (squash), kanin (rice), kare-kare, ice cream and mansanas (apple). Since most of the foods students considered delicious were also their favorites.

NSCB secretary general Jose Ramon Albert said that Filipinos ate an average of 58 grams of meat products a day in 2008, up by 152% from 23 grams in 1978. Filipinos are also eating more chicken at an average of 25 grams per day in 2008, up from 7 grams in 1978. (Cabacungan, 2012)

Fruit Eating Practices. Young and Fors (2009) claimed that high schools in a suburban county near Atlanta, Georgia consuming more fruits and vegetables were more likely to be White or Asian.

“There are lots of factors why Filipinos eat less fruits and vegetables and more meat and poultry and one of them is the mass migration to urban centers and the stress of a city lifestyle during the last three decades. Furthermore, the same report showed Filipinos munching fewer vegetables (down 24% to 110 grams in 2008 from 145 grams in 1978) and fruits (down 485% to 54 grams in 2008 from 104 grams in 1978), (Cabacungan, 2012).

Almost half of the subjects did not at all eat fruits in school during snack time. However, more than 40% of the adolescent's ate fruits in school and at home sometimes. Only 6.5% claimed they ate fruit as snack in school most of the time while 42.2% said they ate fruits as snack at home. (Gonzales JT, et.al., 2016).

Fast-food Eating Practices. Shi, Z.et.al. (2005) stated that the intake of fast food was positively and significantly associated with SES. The intake of fast food and soft drinks were positively and significantly associated with SES. About 10% of the boys from high SES families ate hamburgers daily compared with 2.8% of the boys from the low SES families ($P<0.05$), while the lowest SES group, only one-third as many as in the highest SES group consumed hamburgers that often.

Majabadi, H.A, et.al., (2016) claimed that the following factors that influenced their major reasons for consuming fast food: 1) fast food is delicious; 2) fast-food eateries and restaurants are easily accessible; 3) a greater variety of fast-food options than home-cooked food options is available, providing people with numerous choices; 4) the affordability of fast foods and the fact that they are readily available provide adolescents with a sense of independence; 5) finally, going out to eat fast foods with friends is a way of entertainment, particularly for adolescents.

Walking Habit/Practices. Florentino, R.F. et.al., (2002) claimed that children from private schools were apparently less physically active, were more likely to be driven to school instead of walking, and were more likely to prefer television and computer games over outdoor games. These differences agree with an earlier report on the nutritional status of the children as determined by anthropometry, which showed a higher proportion of overnutrition and a lower proportion of undernutrition among private schoolchildren than among public schoolchildren.

The Philippine Star (2016) reported that Philippines one of Asia's most unhealthy countries, adults are overweight due mainly to insufficient exercise and poor food habits, 30% of Filipino parents admit their children don't get enough exercise.

IV. METHODOLOGY

The study made use of the descriptive method of research utilizing a survey checklist patterned to the London's Global University, Institute of Epidemiology and Health Care Research Department of Behavioural Science and Health, with some modification to suite for Filipinos respondents.

The subject of the study were 82 Junior high school students from Angelcare Science Academy, Suclayin, Baler, Aurora during the School Year 2017-2018. Participants were selected using purposive and simple random sampling.

The respondents were purposively selected based on their concerned on their nutritional status and highest for age. Lists of participants without concerned nutritional status and height for age were selected using simple random sampling using lottery method. Consent was presented to the participants before the administration of the questionnaire.

The data gathered were treated statistically in accordance with the sequence of the problems. Frequency, percentage, weighted mean and correlation were used.

V. RESULTS

Health related practices, food habits and preferences of Millennials

Table 1. Health Related Practices

Health Related Practices	Frequency	Percent
Breakfast Eating Practices		
Eat breakfast regularly	78	96.3
Not Eating breakfast	3	3.7
Junk Food Eating Practices		
Eat Junk Foods regularly	73	90.1
Not Eating Junk Foods	8	9.9
Drinking Soft-drinks Habit		
Drinking Soft-drinks regularly	72	88.9
Not Drinking Soft-drinks	9	11.1
Frequency of Drinking Soft-drinks		
Not drinking soft-drinks	9	11.1
Once a week	4	4.9
Once a day	50	61.7
Twice a Day	13	16
Three Times a day	3	3.7
Four Times a Day	1	1.2
Five Times a Day	1	1.2
Absence/Presence of Illness		
Absence of Illness	59	72.8
With Illnesses	21	27.1
Favorite Viand		
Chicken	30	37.0
Pork	26	32.1
Fish	4	4.9
Vegetables	21	25.9
Vegetables Eating Practices		
Eat Vegetables regularly	21	25.6
Not Eating Vegetables	61	74.4
Fruits Eating Practices		
Eat Fruits regularly	42	51.9
Not Eating fruits	39	48.1
Fast-foods Eating Practices		
Eat Fast-foods regularly	52	64.2
Not Eating Fast-foods	29	35.8
Walking Practices		
Walking at least 1 hour a Day	43	53.1
No walking everyday	38	46.9

Table 2. Eating Habits

Food Habits	WM	VD	R
1. If I am having lunch away from home, I often choose a low-fat option.	1.59	Unh	9
2. I usually avoid eating fried foods.	1.70	H	3
3. I usually eat a dessert or pudding if there is one available.	1.21	Unh	22.5
4. I make sure I eat at least one serving of fruit a day.	1.44	Unh	17

5. I try to keep my overall fat intake down.	1.51	Unh	11.5
6. If I am buying crisps, I often choose a low-fat brand.	2.01	H	1
7. I avoid eating lots of hotdogs and burgers.	1.60	Unh	7
8. I often buy pastries or cakes.	1.40	Unh	18
9. I try to keep my overall sugar intake down.	1.50	Unh	14
10. I make sure I eat at least one serving of vegetables or salad a day.	1.48	Unh	16
11. If I am having a dessert at home, I try to have something low in fat.	1.51	Unh	11.5
12. I rarely eat takeaway meals.	1.33	Unh	20
13. I try to ensure that I eat plenty of fruit and vegetables.	1.38	Unh	19
14. I often eat sweet snacks between meals.	1.51	Unh	11.5
15. I usually eat at least one serving of vegetables (excluding potatoes) or salad with my evening meal.	1.51	Unh	11.5
16. When I am buying a soft drink, I usually choose a diet drink.	1.65	H	4
17. When I put butter or margarine on bread, I usually spread it on thinly.	1.60	Unh	7
18. If I have a packed lunch, I usually include some chocolate and/or biscuits.	1.80	H	2
19. When I have a snack between meals, I often choose fruit.	1.61	H	5
20. If I am having a dessert or pudding in a restaurant, I usually choose the healthiest one.	1.60	Unh	7
21. I often have cream on desserts.	1.49	Unh	15
22. I eat at least 3 servings of fruit most days.	1.22	Unh	21
23. I generally try to have healthy diet.	1.21	Unh	22.5
Overall Weighted Mean	1.52	UNH	

Table 3. Food Preferences

Food Preferences	WM	Verbal Description	Rank
Meat /Fish	3.52	Like a Little	4
Starches	3.62	Like a Little	3
Dairy	3.33	Neither like nor dislike	5
Fruits	3.99	Like a Little	2
Vegetables	3.10	Neither like nor dislike	6
Snacks	4.00	Like a Little	1

Relationship of health related practices and food habits and preferences using Pearson r

Table 4. Relationship of Health Related Practices and Food Habits

Health Related Practices	Pearson's r Value	Approx. Sig.	Verbal Interpretation
Breakfast Eating Practices	-0.010	0.929	Not Significant
Junk-foods Eating Practices	-0.075	0.508	Not Significant
Soft-drinks Drinking Practices	-0.018	0.872	Not Significant
Frequency of Drinking Soft-drink	0.054	0.634	Not Significant
Absence/Presence of Illness	-0.126	0.254	Not Significant
Favorite Viand	-0.297	0.007	Highly Significant
Fruits Eating Practices	0.363	0.001	Highly Significant
Fast-food Eating Practices	0.302	.006	Highly Significant
Daily Walking Practices	0.227	0.041	Significant

Table 5. Summary of Relationships between Health Related Practices and Food Preferences

Health Related Practices	Food Preferences					
	Meat/Fish	Starches	Dairy	Fruits	Veggie	Snack
Breakfast Eating Practices	-0.050ns	.045ns	-.009ns	-.229*	-.082ns	.023ns
Junk-foods Eating Practices	0.058ns	.166ns	.036ns	.067	.055ns	-.164ns
Soft-drinks Drinking Practices	-0.172ns	-.010ns	-.016ns	-.100	-.018ns	.041ns
Frequency of Drinking Soft-drink	0.092ns	.186ns	.104ns	.002	.129ns	-.090ns
Absence/Presence of Illness	-0.142ns	-.171ns	-.112ns	.135	.093ns	-.178ns
Favorite Viand	-0.014ns	.038ns	.163ns	.023	.284**	-.090ns
Fruits Eating Practices	0.112ns	-.038ns	-.137ns	-.141	-.096ns	.060ns

Fast-foods Eating Practices	-0.049ns	-.008ns	-.170ns	-.180	-.191ns	-.012ns
Daily Walking Practices	-0.155ns	.073ns	-.013ns	.011	.090ns	-.167ns

Legend: ** - highly significant
* - significant
ns - not significant

VI. DISCUSSION

As presented in Table 1, majority eat breakfast (96.3%), less than one third eat junk foods (90.1%), 88% drink soft-drinks and 61.7% drink once a day, not eating vegetables (74.4%), 72.8% were no illness, 64.2% eating junk-foods. 64.2% eating fast-foods regularly, 53.1% walking at least 1 hour a day. Chicken and pork were their favourite viand. This result indicates that majority of Millennial respondents have a poor health related practices.

Healthy eating habits includes were choosing low-fat brand crisps (2.01), pack lunch included chocolate and biscuits, (1.80), they avoid eating fried foods (1.70), and they choose fruit in their snack. Unhealthy eating habits were they did not eat 3 servings of fruit most days (1.22), generally they did not try to have healthy diet (1.21) and they did not eat a dessert if there is available (1.21). The overall weighted mean of 1.52 implied that millennial respondents possessed unhealthy food habits.

Millennials preferred snacks (4.00), fruits (3.99), starches (3.62), meat/fishes (3.52). This results show that millennial respondents did not want eats vegetables and dairy products which is the source of nutrients needed by the body.

The relationship of health related practices and food habits indicate that favourite viand, fruit eating, fast-food eating were found highly significant, only daily walking have a significant relationship. This result implies that millennial respondents with unhealthy food habits respondents were preferred chicken and pork, not eating fruits, eat fast-foods and not walking one hour a day.

Highly significant relationship was observed between vegetable preferences and favourite viand while negative significant relationship on fruit preferences and eating breakfast practices. No significant relationships were observed on other variables. This results show that respondents whose vegetable as their favourite viand preferred or like vegetables more, while those eating breakfast they didn't preferred fruits.

VII. CONCLUSIONS

Majority of Millennial respondents have a poor health related which includes eating junk foods, fast-foods, chicken and pork, drinking soft-drinks and less walking.

Millennial respondents practiced unhealthy eating habits such as not eating fruits, vegetables and did not try to have healthy diet.

Favorite viand, eating fruits and fast-food were found highly significant with food habits.

There is highly significant relationship between vegetable preferences and favorite viand while negative significant relationship on fruit preferences and eating breakfast practices.

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AUTHOR

Dr. Oscar T. Vallejo, College Faculty, Wesleyan University – Philippines, Aurora Campus, Maria Aurora, Aurora. Retired Professor VI, Aurora State College of Technology, Baler, Aurora.

Design Calculation of Impeller for Axial Flow Pump

Pauk Pauk*, Cho Cho Khaing**

* Department of Mechanical Engineering, Technological University (Mandalay)

** Department of Mechanical Engineering, Technological University (Mandalay)

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Abstract- Pump technology is a proven technology in the world. The application and use of pumps today are universal. Modern public utilities, chemical plants, municipal water and sewage works, and other fields too numerous to mention would be seriously handicapped if these machines did not exist. An axial flow pump is widely used in water supply process and agricultural process and is designed for the application of high flow rate and low pressure. The axial flow pump includes the impeller rotating inside a casing of sufficient length and that ensures uniform incoming and outgoing flow. Thus, the impeller forces the liquid into a rotary motion by impeller action. This study relates to the impeller design of axial flow pump that can develop a head of 3 m and deliver 0.3 m³/s of water at the speed of 1000 rpm. In the design impeller, outlet diameter is 350 mm, entrance vane angle is 12.78° and discharge vane angle 14.19° at outlet diameter, the hub diameter is 175mm, entrance vane angle is 24.4° and discharge vane angle is 37.62° at hub diameter respectively. The number of blades is four. The clearance between impeller and pipe or casing is 0.35 mm. The designed axial flow pump can fulfill the requirements of agricultural process.

Index Terms- axial flow pump, head, flow rate, speed, specific speed, impeller

I. INTRODUCTION

Pumping may be defined as the addition of energy to a fluid to move it from one point to another or to raise it to the required height. The energy given to the pump case forces the fluid to do work flowing through the pipes rising to the higher level. The input power of the pump is mechanical energy of the drive shaft driven the prime mover such as electric motor or small engine and the output energy is the hydraulic. In industries, throughout the world, pumps play in a major role. Pumps are widely used for irrigation and are most common where pumping from surface water supplies such as river, lakes and streams and rising water to a higher level. Moreover, they are widely used in many other applications such as chemical plants, firefighting, hydraulic system, and so on.

II. COMPONENTS AND OPERATIONAL PRINCIPLE OF AXIAL FLOW PUMP

Axial flow pumps have a very large discharge and are best suited for irrigation purposes. Water enters the pump through the intake bell. It is discharged into the distributor section and then out the discharge elbow. Flowing in essentially a straight line along the pump axis keeps friction and turbulence to a minimum. The components of axial flow pump are rotating impeller, guide vane, casing, suction pipe, discharge pipe and shaft.

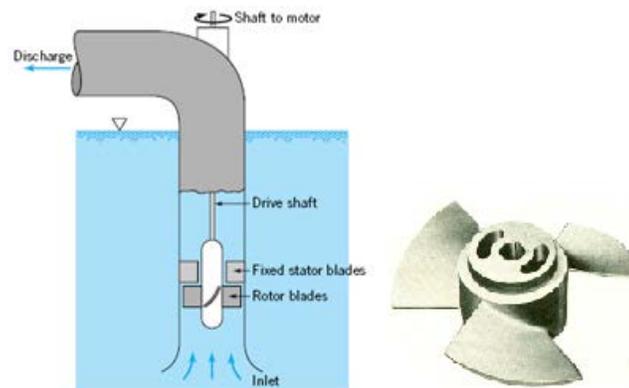


Fig. 1 Schematic Diagram of Axial Flow Pump and Impeller

The water from the sump well is sucked into the suction pipe in an axial direction, and passed through the runner vanes (impeller) and finally discharged through another set of guide blades into the delivery pipe. Suction pipe is essential to provide appropriate suction piping for securing proper pump operation. Head losses along the suction lines should be made minimal. The size of discharge piping must be selected so as to provide appropriate head losses. The shaft is to transmit power to the impeller while withstanding hydraulic thrust and weight of the rotating parts. The guide vane is a device which guides the flowing water. It sets up outlet from the impeller or enters from the suction pipe to be correct passage. By using vane in pump, it is obtained more efficiently that the pump without guide vane.

III. DESIGN OF AXIAL FLOW PUMP'S IMPELLER

Now it is the time to articulate the research work with ideas gathered in above steps by adopting any of below suitable approaches: When the overall design of pump is considered, the shape of an impeller is the most important for optimum efficiency. Impeller design should be in such a way that, losses must be as low as possible. The design of a pump's impeller can be divided into two parts. The first is the selection of proper velocities and vane angles needed to obtain the desired performance with the best possible efficiency. The second is the layout of the impeller for the selected angles and areas.

The specifications of pump that will be designed are:

Pump head,	$H = 3 \text{ m}$
Discharge,	$Q = 18 \text{ m}^3/\text{min} = 0.3 \text{ m}^3/\text{s}$
Rotational Speed,	$N = 1000 \text{ rpm}$
Density of water,	$\rho = 1000 \text{ kg/m}^3$

A. Selection of Specific Speed and Suitable Pump Type

Specific speed is defined as the speed in revolutions per minute at which an impeller would operate if reduced proportionately in size so as to deliver one unit of capacity against one unit of total head. It is used to classify the type of impellers on their performance, and proportion regardless of their actual size or the speed at which they operate. It is mathematically expressed as

$$N_s = \frac{3.65 \times N \times \sqrt{Q}}{H^{3/4}} \tag{1}$$

In this design, calculated value of specific speed based on required head and capacity is 877 rpm and it is within the range of high specific speed pump that is 400 and 1200. So, axial flow pump type that is high specific speed pump is chosen in this study.

B. Determination of Impeller Hub-Ratio and Blade Number

The ratio of impeller hub diameter and outside diameter, D_d/D_o can be determined based on specific speed. Thus, the impeller hub ratio is

$$D_d = 26.8 (N_s)^{-0.603} \tag{2}$$

For the calculate value of specific speed 887 rpm, the hub-ratio, D_d or D_d/D_o is 0.5.

Table I. Specific Speed versus Impeller Hub-ratio and Number of Blades [5]

Specific speed (rpm)	400	600	800	1000	1200
Impeller Hub- ratio	0.6	0.55	0.5	0.45	0.4
Number of blades	6	5	4	3	2

From Table I, the number of blades can be selected based on N_s and the hub ratio. Thus, the number of blades, Z is 4.

C. Determination of Input Power

The water horsepower can be determined by the following equation.

$$WHP = \rho g Q H \tag{3}$$

Then, the brake horsepower can also be determined by using the following equation.

$$BHP = \frac{WHP}{\eta_o} \tag{4}$$

Where, η_o is overall efficiency of axial flow pump and it is taken as 0.85 in this study.

D. Prediction of Pump's Shaft Diameter

The shaft diameter at hub section of impeller is

$$d_s = \sqrt[3]{\frac{16 T}{\pi \tau}} \tag{5}$$

Where, T is the torsional moment and it can be estimated by

$$T = \frac{60 BHP}{2 \pi n} \tag{6}$$

Allowable shear stress of material of shaft, τ is 24.5 MPa because the main shaft is made of S30C. The estimated shaft diameter will be increased about 20% because it is difficult to predict the bending moment at this time [7]. Thus, the estimated shaft diameter is 33 mm.

E. Determination of Impeller Diameters and Clearance

The impeller diameter can be determined by

$$D = (0.1 \sim 0.08) \sqrt{Q \times 60} \tag{7}$$

Thus, $D_{max} = 0.1 \times \sqrt{Q \times 60}$ (8)

$D_{min} = 0.08 \times \sqrt{Q \times 60}$ (9)

For the average value of D_{max} and D_{min} , the impeller diameter is D is 0.35 m.

The calculated impeller outside diameter can be checked up by using the following optimum diameter equations.

$D_{opt} = (4 \sim 4.6) \times \sqrt{\frac{1}{(1-D_d^2)}} \times \sqrt[3]{\frac{Q}{N}}$ (10)

Thus, $D_{opt1} = 4 \times \sqrt{\frac{1}{(1-D_d^2)}} \times \sqrt[3]{\frac{Q}{N}}$ (11)

$D_{opt2} = 4.6 \times \sqrt{\frac{1}{(1-D_d^2)}} \times \sqrt[3]{\frac{Q}{N}}$ (12)

In this design, the value of impeller diameter $D = 0.35$ m is within the range $D_{opt1} = 0.309$ m and $D_{opt2} = 0.356$ m.

Moreover, the impeller diameter, D can also be checked up the flow velocity equations.

$v_z = (0.06 \sim 0.08) \times \sqrt[3]{Q \times N^2}$ (13)

Thus, $v_{z1} = 0.06 \times \sqrt[3]{Q \times N^2}$ (14)

$v_{z2} = 0.08 \times \sqrt[3]{Q \times N^2}$ (15)

And then, the impeller diameter can be compared with the following diameter equations.

$D_{max} = 2 \times \sqrt{\frac{Q}{\pi \times v_{z1} \times (1-D_d^2)}}$ (16)

$D_{min} = 2 \times \sqrt{\frac{Q}{\pi \times v_{z2} \times (1-D_d^2)}}$ (17)

The maximum and minimum diameters are 0.308 m and 0.356 m respectively. Therefore, the impeller outside diameter for axial flow pump D_o is taken as 0.35 m.

After selecting the suitable impeller outside diameter, inner diameter or hub diameter of impeller can be determined by the following equation.

$D_h = D_d \times D_o$ (18)

If the hub-ratio is 0.5, the hub diameter is 0.175 m.

The clearance between casing pipe and outside diameter of impeller blades is

$\delta = 0.001 \times D_o$ (19)

F. Impeller Radii, Chord Length and Blade Spacing

The radii of runner can divided into five cylindrical sections and these sections can be expressed by the following equations.

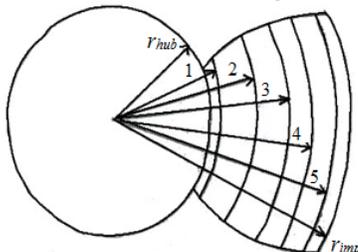


Fig. 2 Five Cylindrical Sections of Runner Blade

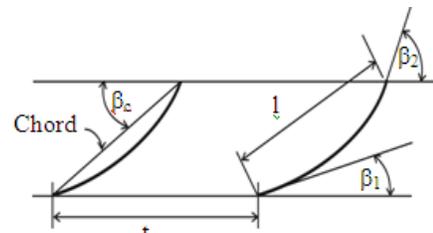


Fig. 3 Chord Length and Blade Spacing

Section I, $r_1 = \frac{d}{2} + (0.015 \text{ to } 0.025)d$ (20)

Section III, $r_3 = \frac{D}{2} \sqrt{\frac{(1+d)^2}{2}}$ (21)

Section V, $r_5 = \frac{D}{2} (0.015 \text{ to } 0.025)D$ (22)

Section II, $r_2 = r_1 + \frac{r_3 - r_1}{2}$ (23)

Section IV,
$$r_4 = r_3 + \frac{r_5 - r_3}{2} \tag{24}$$

Vane length called chord length (l) is one of the important factors affecting the head and the specific speed of axial flow turbine. The ratio of the vane area to the free area between the casing outer wall and the hub is referred to as solidity. However, the ratio of chord length and vane spacing (l/t_s) is used more frequently for the same purpose. The ratio l/t_s varies along the radius, increasing toward the hub. The increase in l/t at the hub is desirable for mechanical reasons.

The allowable ratio l/t at the outside diameter of runner can be determined by the following relationship.

$$\frac{l}{t} = 5.95 K_H \tag{25}$$

Where, K_H is head coefficient and it can be expressed by the following equation.

$$K_H = \frac{H}{D^2 (N/60)^2} \tag{26}$$

The relation between the values of l/t at the hub and at the outside diameter of the runner can be shown by the following equation.

$$\left(\frac{l}{t}\right)_{hub} = (1.25 \text{ to } 1.30) \left(\frac{l}{t}\right)_{periphery} \tag{27}$$

Where, t is the spacing between the adjacent vanes and it can be determined by the following.

$$t = \frac{2 r \pi}{z} \tag{28}$$

G. Circulation Speed of Fluid Element (Γ)

The total circulation around the blade of pump can be calculated by using Equation

$$\Gamma = \frac{2 \times \pi \times g \times H}{\omega \times \eta_{hyd}} \tag{29}$$

Where, ω is angular velocity and it is expressed by

$$\omega = \frac{2\pi \times N}{60} \tag{30}$$

In this design, hydraulic efficiency of pump η_{hyd} is taken as 0.85. The circulation speed per blade is

$$\Gamma_n = \frac{\Gamma}{z} \tag{31}$$

IV. RESULTS OF IMPELLER DESIGN

The simplified inlet and outlet velocities diagrams for the impeller are shown in Fig. 4 and Fig. 5. For a fluid flowing through the rotating impeller, u is the tangential velocity, V is the absolute velocity and v is the relative velocity of a fluid particle to impeller rotation. The angle between V and u is α and the angle between v and u is β and it is the angle made by tangent to the impeller vane and a line in the direction of motion of the vane. The tangential component and radial component of absolute velocity V are V_u and v_z respectively.

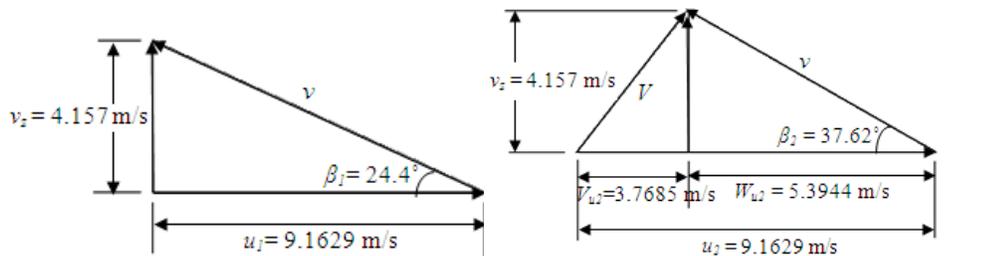


Fig. 4 Inlet and Outlet Velocity Diagrams at Hub Diameter

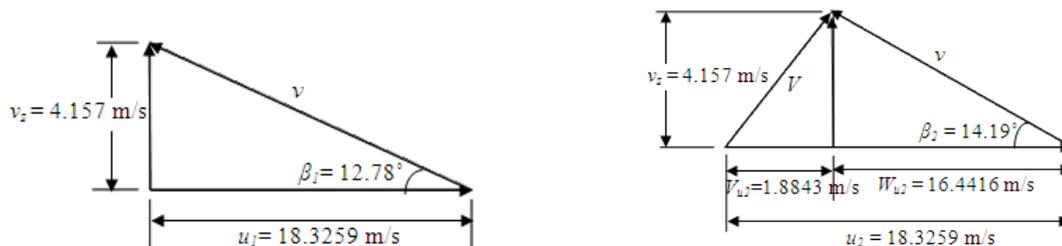


Fig. 5 Inlet and Outlet Velocity Diagrams at Outside Diameter

The calculated results in Table II are parameters of impeller design for the required head 3 m and 0.3 m³/s.

Table II. Calculated Results of Minimum Allowable Solidity of Impeller Blades

	Units	I	II	III	IV	V
r	m	0.095	0.12	0.14	0.155	0.17
$v_z = \frac{4Q}{\pi(D_o^2 - D_h^2)}$	m/s	4.157	4.157	4.157	4.157	4.157
$u = \frac{\pi \times D \times N}{60}$	m/s	9.948	12.566	14.661	16.232	17.802
v_{u1}	m/s	0.000	0.000	0.000	0.000	0.000
v_{u2}	m/s	3.471	2.748	2.355	2.128	1.940
$\tan \beta_1 = \frac{v_z}{u - v_{u1}}$	-	0.418	0.331	0.284	0.256	0.234
$\tan \beta_2 = \frac{v_z}{u - v_{u2}}$	-	-	0.642	0.423	0.338	0.295
β_1	rad	0.396	0.319	0.276	0.251	0.229
β_1	deg	22.70	18.300	15.800	14.400	13.100
β_2	rad	0.571	0.401	0.326	0.287	0.256
β_2	deg	32.70	23.000	18.700	16.400	14.700
$\Delta\beta$	deg	10.00	4.700	2.900	2.000	1.600
$\left(\frac{l}{t}\right)_{allowable}$	-	0.800	1.000	0.660	0.500	0.500
$\left(\frac{l}{t}\right)$	-	-	-	-	-	0.500

Table III. Calculated Results of Thin and Equivalent Camber Line of Impeller Blade Profile

	I	II	III	IV	V
R	0.095	0.120	0.140	0.155	0.170
T	0.149	0.188	0.220	0.243	0.267
l/t	0.800	0.700	0.630	0.550	0.500
L	0.119	0.132	0.139	0.134	0.133
$T_o = t/l$	1.250	1.428	1.587	1.818	2.000
Γ	2.072	2.072	2.072	2.072	2.072
Γ_n	0.518	0.518	0.518	0.518	0.518
$w_{u\ ave} = u - \left(\frac{v_{u1} + v_{u2}}{2}\right)$	8.213	11.192	13.484	15.168	16.832
$\tan \beta_{ave} = \frac{v_z}{w_{u\ ave}}$	0.506	0.371	0.308	0.274	0.247
$\beta_{ave} = \alpha'$	26.800	20.400	17.100	15.300	13.900
$w_{ave} = \frac{w_{u\ ave}}{\cos \beta_{ave}}$	9.205	11.939	14.110	15.727	17.338
$L = f(T_o, \alpha')$	1.800	1.700	1.800	1.750	1.800
$\beta_p = \frac{57.3 \times \Gamma_n}{w_{ave} \times l} \times \frac{1}{L}$	15.059	11.078	8.409	8.286	7.151
$\Delta\alpha = f(T_o, \beta_p)$	0.600	0.250	0.125	0.125	0.120

<i>A</i>	27.4	20.650	17.225	15.430	14.020
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Table IV. Calculated Results of Blade dimension at Various Diameter

	I	II	III	IV	V
<i>r</i>	0.095	0.120	0.140	0.155	0.170
<i>D</i>	0.190	0.240	0.280	0.310	0.340
β_2	32.700	23.00	18.70	16.40	14.70
$\theta_2 = 90 - \beta_2$	57.300	67.00	71.30	73.60	75.30
$f(l) = f(l/t, \theta_2)$	0.120	0.10	0.080	0.030	0.005
$dm/l = f(l/t, \theta_2)$	0.100	0.075	0.055	0.035	0.020
$\left(\frac{\Delta\beta}{2}\right) = \tan^{-1}\left[2 \times \left(\frac{f}{l}\right) \times \left(\frac{d_m}{l}\right)\right]$	1.375	0.859	0.504	0.120	0.011
$\beta_d = \beta_p + 2\left(\frac{\Delta\beta}{2}\right)$	17.809	12.797	9.417	8.526	7.174
$R_d = \frac{l}{2 \sin \beta_d}$	0.195	0.298	0.425	0.452	0.532
$l_d = \frac{0.0175 \times l \times \beta_d}{\sin \beta_d}$	0.121	0.133	0.140	0.135	0.134

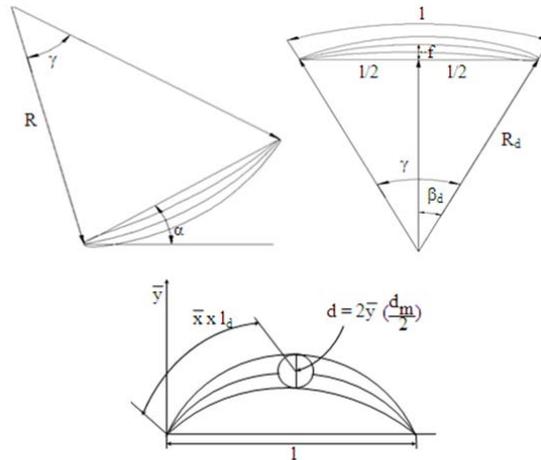


Fig. 6 Sketch for Geometric Characteristic of Blade Curvature [5]

Table V. Results of x_d or $\bar{x} \times l_d$ for blade profile

	I	II	III	IV	V
\bar{x}	$x_d = \bar{x} \times l_d$				
0.0000	0.000	0.000	0.000	0.000	0.000
0.0025	0.303	0.333	0.350	0.338	0.335
0.0050	0.605	0.665	0.700	0.675	0.670
0.0100	1.210	1.330	1.400	1.350	1.340
0.0250	3.025	3.325	3.500	3.375	3.350
0.0500	6.050	6.650	7.000	6.750	6.700
0.1000	12.100	13.300	14.000	13.500	13.400
0.1500	18.150	19.950	21.000	20.250	20.100
0.2000	24.200	26.600	28.000	27.000	26.800
0.3000	36.300	39.900	42.000	40.500	40.200
0.4000	48.400	53.200	56.000	54.000	53.600
0.4500	54.450	59.850	63.000	60.750	60.300
0.5000	60.500	66.500	70.000	67.500	67.000
0.6000	72.600	79.800	84.000	81.000	80.400
0.7000	84.700	93.100	98.000	94.500	93.800
0.8000	96.800	106.400	112.000	108.000	107.200
0.9000	108.900	119.700	126.000	121.500	120.600
0.9500	114.950	126.350	133.000	128.250	127.300
0.9700	117.370	129.010	135.800	130.950	129.980

Table VI. Results of $r_d = \bar{y} \times d_m / 2$ for blade profile

	I	II	III	IV	V
\bar{y}	$\bar{y} \times \frac{d_m}{2}$				
0.000	0.000	0.000	0.000	0.000	0.000
0.147	0.875	0.728	0.562	0.345	0.196
0.196	1.166	0.970	0.749	0.461	0.261
0.294	1.749	1.455	1.123	0.691	0.391
0.405	2.409	2.005	1.547	0.952	0.538
0.516	3.070	2.554	1.971	1.213	0.686
0.662	3.939	3.277	2.529	1.556	0.880
0.763	4.539	3.777	2.915	1.793	1.015
0.840	4.998	4.158	3.209	1.974	1.117
0.949	5.647	4.698	3.625	2.230	1.262
0.998	5.938	4.940	3.812	2.345	1.327
1.000	5.950	4.950	3.820	2.350	1.330
0.982	5.843	4.861	3.751	2.308	1.306
0.895	5.325	4.430	3.419	2.103	1.190
0.756	4.498	3.742	2.888	1.777	1.005
0.560	3.332	2.772	2.139	1.316	0.745
0.342	2.041	1.698	1.310	0.806	0.456
0.222	1.321	1.099	0.848	0.522	0.295
0.168	0.999	0.832	0.642	0.395	0.223

0.9900	119.790	131.670	138.600	133.650	132.660
1.0000	121.000	133.000	140.000	135.000	134.000

0.092	0.547	0.455	0.351	0.216	0.122
0.000	0.000	0.000	0.000	0.000	0.000

Results data of x and y coordinates for blade profiles of five sections are shown in Table V and VI. By using these results, detail drawings of blade profiles are shown in following figures.

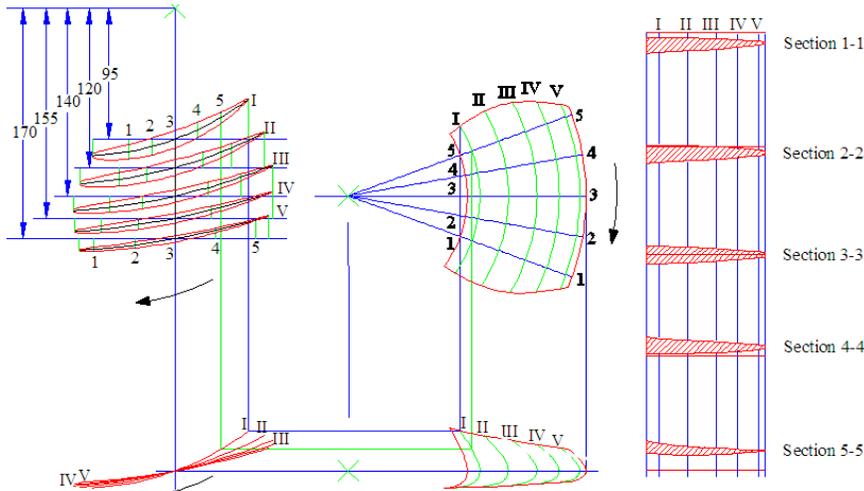


Fig. 7 Two Dimensional View of Blade Profile for Impeller

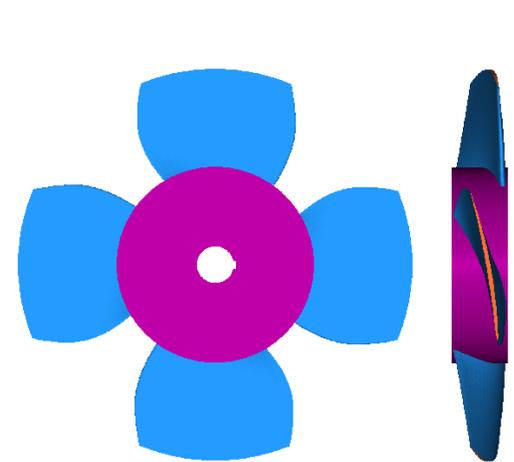


Fig. 8 Three-Dimensional View of Impeller

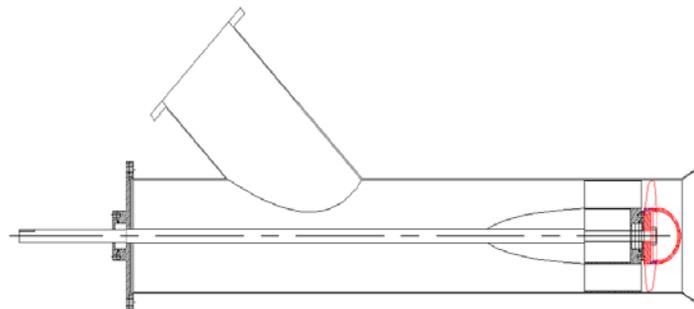


Fig. 9 Assembly Drawing of Axial Flow Pump

V. CONCLUSION

The designed pump is aimed to use in the application of agriculture process and water supply process which have about eight working hours per day and requires low head and high capacity. So, axial flow pump type is selected. The designed pump can develop a head of 3m and deliver $0.3\text{m}^3/\text{sec}$ of water at 1000rpm. According to the design result, impeller has 14in (350mm) outlet diameter, 12.78° entrance vane angle and 14.19° discharge vane angle at outlet diameter and 7in (175mm) inlet diameter, 24.4° entrance vane angle and 37.62° discharge vane angle at inlet diameter respectively. The number of vanes is four. The clearance between impeller and pipe or casing is 0.01in (0.35mm). The design pump is used only to pump water at 70°F and if very hot water is used this pump will be damaged. The designed axial flow pump can fulfill the requirements of agricultural process and then can improve pump efficiency.

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AUTHORS

First Author – Pauk Pauk, Lecturer, Department of Mechanical Engineering, Technological University (Mandalay) and kopaukgyi@gmail.com

Second Author – Cho Cho Khaing, Lecturer, Department of Mechanical Engineering, Technological University (Mandalay) and khaingcho999@gmail.com

Review Article: Individual Safety and Health at the Workplace

Huinee Voon*, Tengku Mohammad Ariff**

* Institute of Community Development and Quality of Life (i-CODE), Universiti Sultan Zainal Abidin

** Institute of Community Development and Quality of Life (i-CODE), Universiti Sultan Zainal Abidin

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Abstract- Accidents and human errors at the workplace are usually deal with safety being emphasized. However, as physical and engineering approach are usually use to prevent workplace incidents and accidents that may results in physical injuries or harms, there are scarcity on what is known regarding a worker's mental health and well-being in relation with their job. Objectives: To relate health-related theories at the interpersonal level with individual behavioural health change at the workplace; and to study the relation between physical and psychosocial factors towards individual health and safety behavior. Methodology: A descriptive study, theoretical analysis. Results and discussion: Safety and health are two terms that are closely related to each other in terms of the effects of each domain on one another. As safety is mainly concern with physical hazards at the workplace, psychological hazards may effect on workers mental health and well-being that its consequences may be have adverse effects on the people and the individual himself. Conclusion: Although safety aspects are mainly emphasized in most workplaces, however, the health-related concerns that ensue from implementing those safety rules, where workers' individual health attributes that may have an impact on workplace safety should also be taken into concern.

Index Terms- Occupational, Behaviour, Work-Related, Injuries, Accidents

I. INTRODUCTION

According to World Health Organization Western Pacific Region^[1], a healthy workplace is defined as one in which employees and managers work together to exercise a continuous

improvement process to ensure and promote the safety, health and well-being of every employees and the sustainability of the workplace in view of several aspects, appropriate to recognized needs such as: safety and health conditions in the physical work environment; safety, health and well-being conditions in the psychosocial work setting that consist of organization of work and workplace culture; personal health resources in the workplace; and approaches of engaging in the community to enhance the health of employees, their families and other people in the community. Even though organisations implemented and followed the laws, regulations, and guidelines, workers intentional or unintentional conducts at work may still affects their health negatively. It is important to maximise the prevention of avoidable occupational accidents and injuries, and in the same time reducing time loss injuries resulting from occupational-related accidents and injuries over whose occurrence the workplace had limited control.

Occupational Safety and Health

The harmful nature of occupational health hazards may cause health issues that only arise after a prolonged period of contact with the harmful exposure and harm. As such it is difficult to associate health effects to the workplace and measure the efficiency of risk controls methods in the prevention of ill health. Safety hazards are mostly tangible as compare to health hazards that are intangible, such as toxic particles floating freely in the air. Thus, there is a difficulty in distinguishing cause to which occupational health safety often outweigh occupational health because organizations' care responsibility becomes vague and difficult to implement (Lunt, 2013)^[2]. Occupational accidents are avoidable if both employers and employees have due concerns regarding safety issues or practicing good safety behaviour (Makin & Sutherland, 1994)^[3]. In a risk control effort,

risk elimination or designing out should be prioritized as to alternatives measures that involve management or individual protective measures. Although appropriate and tight controls, human fallibility will still takes place in which workers may intentionally or unintentionally risk their or fellow workers health. Nonetheless, organization's culture or administration systems may cause behavioural safety programs or interventions to overlook latent unsafe behaviours (Lunt, 2013) ^[2].

Physical health encompasses a spectrum of conditions, from having a diagnosed illness at one extreme, from a condition in which the individual without specific disease yet is not at their ideal health status, across optimum health and well-being at the other end. While traumatic injuries are usually directly noticeable to both the victim and witnesses, this is contrary in the case of work-related diseases and cumulative injuries such as noise-induced hearing loss and various musculoskeletal disorders. Normally it may take years for a disease to come to be apparent in an employee, and then the association to workplace exposure may be uncertain or not identified at all. Hence, occupational diseases and cumulative injuries have been extremely under reported and frequently under identified in relation to their statistics. WHO estimates that 1.7 million people succumbed to occupational diseases yearly and the there are 160 million prevalent cases of occupational disease. These comprise both communicable and non-communicable diseases (NCD). WHO estimates 16% of hearing loss, 11% of asthma, 9% of lung cancer cases globally are attributable to occupational exposure, while 40% of hepatitis B and C infections in health care staffs are caused by needle-stick injuries during work ^[4]. WHO concludes that 200,000 people die from work-related cancers every year ^[5]. These diseases are not evenly dispersed, with females and other vulnerable employees suffering more than their share.

II OBJECTIVES

1. To relate health-related theories at the interpersonal level with individual behavioural health change at the workplace.
2. To study the relation between physical and psychosocial factors towards individual safety and health behavior.

III METHODOLOGY

A descriptive study, theoretical analysis

IV FINDINGS AND DISCUSSION

1. To relate health-related theories at the interpersonal level with individual behavioural health change at the workplace.

Positive changes in health behaviour can be achieved by understanding the reason that prompt or influence a person to act as they do. For this purpose, theories and models of health behaviour have been established with the aim of getting a systematic view of events or situations by identifying associations between variables so that explanation and prediction about events or situations that occurs can be studied. In addition, the methods to influence or change behaviour can be more effective when intervention strategies are developed based on the identified information (Glanz & Maddok, 2002) ^[6]. Theories can be applied in the planning, implementation, and evaluation phases of interventions on addition of leading investigations why people are not practicing a health-related behaviour or following given medical advises. Thus, change models are introduced to guide an individual towards positive health behaviour. Theories relating to health behaviour often similar each other in one way or another and no particular theories or models dominated studies or practice in the field. Health behaviour is a complex and multifaceted term to be explained by only one theory or model (Glanz & Maddock, 2002) ^[6]. Nevertheless, these explanations for behaviour and models for change have some mutual notions and common themes that emphasised on diverse factors that comprised of factors at the individual, interpersonal, and community level. These theories have been tested in earlier studies and have helped in understanding or predicting health behaviours. Some models that were based on several theories have helped to provide an understanding on a specific problem in a particular setting or context.

1.1 Social Learning/ Social Cognitive Theory

Social learning/ social cognitive theory was established on the belief that behaviour was determined by expectations and benefits about environmental cues. How events are interconnected, consequences of an individual's actions like how outcomes and competency to achieve is influenced by the behaviour and the behaviour needed to influence outcomes such as self-efficacy as suggested by Bandura (1977) ^[7] are included in six concepts in Social Learning/ Social Cognitive Theory, which are: **Reciprocal Determinism**, where the interaction between an individual and environment bring about behaviour changes that are bi-directional. The people who are involved will have to make adjustments to the situation if needed. **Behavioural Capability** involves knowledge and skills to influence behaviour. Information and training about actions are offered to change behaviour. In **Expectations**, beliefs about conceivable results of action. Information about possible consequences of actions is included in recommendations. **Self-Efficacy** is the ability to act and persevere in action. Strengths are pointed out, persuasion and supports are used while changing behaviour in small steps. **Observational Learning** is having beliefs that centres on studying others like one own self or have evident physical results. Others' experiences are pointed out and identity role models physical changes to follow. **Reinforcement**, is where feedbacks to an individual's behaviour that increase or reduce the probability of relapse. Incentives, rewards, praise are given and

self-reward are encouraged to decrease the chance of negative responses that discourage positive changes.

1.2 Theory of Reasoned Action

Theory of Reasoned Action (TRA) developed by Fishbein and Ajzen (1977) ^[8] proposed that an individual's behaviour is determined by his intention to perform behaviour and it is a reflection of his attitude toward the behaviour and his subjective norms. Intention is the direct antecedent of behaviour and the cognitive perspective of an individual's willingness to carry out a particular behaviour. An individual intention is determined by three things: the person's attitudes toward the specific behaviour or recommended actions, the person's subjective norms which involve the sense of social pressure towards taking actions, and his perceived behavioural control or confidence in controlling his behaviour.

Theory of Reasoned Action (TRA) explained voluntary or decision making behaviour and that social behaviour are encouraged by a person's attitude in carrying out behaviour. An individual's beliefs about the consequences of his or her behaviour and an appraisal of the value of those actions will influence the behavioural change of that person (Moon & Kim, 2001) ^[9]. This theory was always used health promotion programs. An expansion of TRA is the Theory of Planned Behaviour (TPB).

1.3 Theory of Planned Behaviour

The Theory of Planned Behaviour (Ajzen, 1991) ^[10] suggested that when measuring attitude toward behaviour, only particular attitudes toward the behaviour performed can be expected to predict that behaviour. Subjective norms are the beliefs about how a person's social circle will view the behaviour in question and also, can be used as key to predict a person's intentions and knowing an individual's attitudes. Finally, perceived behavioural control is defined as a person's perceptions of their ability to execute a particular behaviour. These predictors all lead to intention.

TPB discusses questionable behaviours in relation to an individual's decision making or choice making behaviour. Decomposed Theory of Planned Behaviour (DTPB) is a model developed from TPB that provides new facet in handling safety issues and looking at the safety concerns from the management and psychological point of view (Taylor & Todd, 1995) ^[11].

1.4 Social Support

Social Support defines the structure, processes and roles of social relationships and is one of the main functions in social relationships. Social networks are connections between individuals that may offer social support and that may assist

purposes other than giving support (Glanz, Rimer, & Lewis, 2002) ^[12]. Social networks are the term closely associated to social support. The relationship between social supports with health was established by Cassel (1976) ^[13]. Different interventions can be used for promoting health by being able to recognize the influence of social relationships on health status, health behaviors and health decision. Applications of social support approaches include identifying the importance of networking or training of individuals in networks. According to House (1981) ^[14], social support can be categorized into four main types. **Emotional support** involves the sharing of life experiences. It consists of the formation of empathy, love, trust and caring. **Instrumental support** involves the offering of tangible support and services that directly help deprived individual. It is offered by individuals in close circles such as friends, fellow workers, and people in the neighbourhood. **Informational support** involves the offering of guidance, recommendations, and information that an individual can take to tackle problems. **Appraisal support** involves the offering of information that is beneficial for self-assessment purpose such as positive advice, assertion and social appraisal.

2. To study the relation between physical and psychosocial factors towards individual health and safety behavior.

Safety and health are two terms that are closely related to each other in terms of the effects of each domain on one another. Occupational health is concern with every aspect of safety and health at work and includes a key emphasis on primary prevention of hazards, according to the definition given by World Health Organization ^[15]. Health is characterized as 'a state of physical, mental and social well-being at whole and not merely the absence of disease or infirmity. As safety is mainly concern with physical hazards at the workplace, psychological hazards may effect on workers mental health and well-being that its consequences may be have adverse effects on the people and the individual himself. A broad range of workplace hazards also expose individuals in the workplace to occupational-related safety and health risks such as the exposure to chemicals, biological, physical, and ergonomic hazards, which involve a complex network of safety risks and a wide array of psychosocial risk factors ^[16]. The physical work environment is defined as the component of the workplace environment that can be noticed by human or technological senses, comprising the building, air, machineries, furniture, products, chemicals, materials and processes that exist or that take place in the work environment, and which can impact on the physical or mental safety, health and well-being of employees. While developed countries may regard this to be key aspect to occupational safety and health, the truth remains that in large parts of the world, hazards of this type endanger the lives of employees on every single day. And even in developed countries, completely avertible injuries and illnesses keep on occurring. Hazards that present in the physical environment typically have the likelihood to kill and disfigure employees at once and horrifically. When prioritizing issues for attending concerns it is reasonable to reflect on Maslow's (1943) ^[17] hierarchy of needs, where safety and security is at the bottom of the pyramid. Most hazards in the physical work environment would be categorised into this aspect of human needs. Healthy

workplace issues in the physical environment consist of the different types of hazard that may be present in the physical work environment, such as: chemical, physical, biological, ergonomic, and mechanical. Physical safety hazards are typically the first type of hazard to be encompassed in safety & health legislation, when it exists. If injuries are caused from these hazards, they are also the most likely to be covered by any type of workers' compensation that is available. Despite the possibility that most nations have some kind of regulation to prevent these types of injuries, they continue to occur at a worrying rate. Furthermore, non-physical, or psychosocial hazards in the workplace can also have an effect on physical safety. Moreover, psychosocial hazards can be linked with injuries in either a direct or indirect way. When workers lack sufficient control over dangerous situations at work, they not have the control required to diminish threats. Therefore, lack of control can *directly lead* to an injury. Nevertheless, *indirect* effects can be just as hazardous. Employees being exposed to psychosocial hazards may sleep poorly, using unnecessary or excessive medications, indulge in heavy drinking, feel depressed, feel distress, agitated and nervous, and feeling angry and impulsive, frequently caused by a sense of unfairness or inequity. When individuals engage in these behaviours or emotional states, it is more likely they will have temporarily diverted attention, make serious mistakes in judgement, put their bodies under stress, and proliferate the likelihood for strains and sprains; and fail in normal activities that involve hand-eye or foot-eye coordination.

2.1.1 Human Error

According to Reason (1990) ^[18], human error is defined as a general concept that covers all occurrences where a chain of physical or mental tasks unable to reach its expected outcome and when these failures cannot be attribute to the intervention of some accidents. Human error is a multifaceted concept that has gained perpetual attention among investigators of human factors, and has been constantly recognised as a causal factor in a high numbers of accidents in complex and dynamic systems (Reyes, de la Rivaa, Maldonadob, Woocaya, & de la Oa, 2015) ^[19]. Human factors are referred as individual's' perceptual, mental and physical abilities to interact with their work and occupational environment, and the impact of machine and system design on human performance. This also includes occupational safety-related behaviour which is being influenced by the type of organisations (*Health and Safety Executive*, 1989) ^[20].

2.1.1.2 Individual Attributes towards Errors

Exposure to hazards such as moving parts of machines can result in serious injuries or even deaths (Chinniah, 2015) ^[21]. Also that, exposure to hazards in different forms such as chemicals, biological agents, physical factors, ergonomic conditions, allergens, a complex linkage of dangers that jeopardises safety, and a wide range of psychosocial risk factors can present risks to safety and health of workers although international standards, national standards, and regulations have covered the principles regarding machine safety, risk assessment

and risk reduction (Akalpa et al., 2015) ^[22]. Another possible factor that has been recognised in safety and health behaviours and in the context of individual safety are the demographic characteristics of employees at work. The role of gender on the perception of safety in the workplace, compliance with safety management, and accident frequency was investigated in a study done by Gyekye and Salminen (2011) ^[23] in which female workers were found to have a more positive safety perception, more complaint towards safety management procedures, and had a lower rate of accident compared to male workers. The lower number of female workers can be the reason on the difference in occupational injuries faced by male and female workers in high risk industries (Toscano, Windau, & Knestaut, 1998) ^[24]. This was in contrast with a study done by Taiwo et al. (2009) ^[25], where females were more frequently involved in injuries than males in heavy manufacturing sectors. *Congruent Theory* (Holland, 1997) ^[26] and *Person-Environment Fit* (Sherry, 1991) ^[27] are two theories that based gender and job characteristics in which individuals involve themselves in or given roles that are appropriate with traditional views on femininity and masculinity. Female workers are commonly given roles that are less physically demanding and are seldom positioned in risky or dangerous job situations as compared to male workers which in turn reduced their exposure to accidents (Konrad et al. 2000) ^[28]. It is reported that male workers be disposed to disregard safety measures and voluntarily involve in unsafe behaviours more frequently than females (Harris & Jenkins, 2006) ^[29]. Females have the disposition to appraise common danger more frequently and the tendency to apprehend the severity of adverse consequences and thus avoiding them (Harris & Jenkins, 2006) ^[29]. For instance, a study by Waldron, MacClosky, & Earle (2005) ^[30] on road accidents found that women be likely to wear seat belts voluntarily in contrast to men. Another study revealed that women also less frequent to run yellow lights (Holland & Hill, 2007) ^[31].

Higher degrees of job satisfaction, organizational support, organisation citizenship behaviours, work safety perception, and safety compliance are found in older workers compared to young workers (Gyekye & Salminen, 2009b, 2009c) ^{[32][33]}. A review conducted by Breslin et al., 2007 ^[34] on nine cross-sectional studies showed that hazard exposure, perceived work overload and job characteristics have different effects on work injuries that occurred among young workers. Young workers that were school dropouts had three times occupational injuries as compared to young workers with a high school degree in Canada (Breslin, 2008) ^[35]. It is also shown that experience solely did not lower the rate of injuries independent of age (Gun & Ryan, 1994) ^[36]. Researches on the associations between work experience and compliance with safety policies is relatively scarce and contradictory. A study carried out by Zeitlin (1994) ^[37] found overall safety compliance to be highest among the inexperienced workers while another study done by Paul and Maiti (2007) ^[38] which employed a multivariate analysis did not found such correlation in which both experienced and inexperienced workers have the tendency to ignore safety procedures. Workers that had more experience possessed greater views relating to safety as compared to inexperienced workers and this positive correlation could be attribute to the concept of

familiarity and risks perception in which awareness of safety, sensitivity to unsafe circumstances, and thoughtfulness be likely to increase with experience. Workers displayed more compliance towards safety procedures when they have the prior knowledge on the type of hazards they are being exposed to within a particular organisational context (Probst, 2002; Probst & Brubaker, 2001)^{[39][40]}, in contrast to inexperienced workers who comparatively have less knowledge and familiarity with conditions at the workplace that can contribute to inappropriate or incorrect safety behaviours. Education is commonly referred as a learning process in which individuals develop their cognitive abilities and to acquire knowledge and information (Gyekye & Hyabatollahi, 2015)^[41]. In a study done by Gyekye and Salminen (2009a)^[42], the findings indicated that there was a positive relationship between education and safety perception. Also, higher educated employees were reported to have the best perceptions on safety and were the most compliant group with safety management policies. In a study conducted by Stojadinovic et al. (2012)^[43], highly educated underground coal miners in Serbia had the lowest injury rate.

In developed nations, females are exposed more than males to highly repetitive activities and awkward body positions, and their risk of musculoskeletal disorders (MSDs) is more than a few times higher^{[44][45][46]}. What is not generally known is that psychosocial environments associated to the organization of work can be one of the risk factors as well^{[47][48]}. However, the notion that psychological stress can lead to, or cause, MSDs is not intuitively clear. Various physiological mechanisms that take place during stress most likely are a factor to this relationship, comprising increases in non-voluntary muscular tension and cortisol levels, changes in pain perception and decreases in muscle repair and blood testosterone levels^[49]. A finding indicated that the cost of a diabetic employee to a company is five times higher that of employees without diabetes^[50]. Numerous studies done in the past have shown that poor health negatively influences productivity. Individuals that suffered from poorly controlled allergies were 13% less productive as compared to other employees^[51]. Burton et al., (1999) established a comprehensive Worker Productivity Index and presented that as the number of health risk factors greater, productivity lessened^[52]. Other findings showed that health-related productivity costs were 4 times higher than medical and pharmacy costs^[53]. The direct costs for the organization of poor health in employees varies greatly on the regulatory system in the nation concerned, and the system primary health care is delivered. In developing countries, it is not as likely that the employer will pay for health insurance, but they still shoulder the cost of absent workers. As the population get older, these will become even more prevalent, and the consequence on productivity is formidable to foresee.

2.1.1.3 Relationship between physical and psychosocial factors towards individual safety and health behavior

When physical health is affected, it has an impact on the mind, and when mental health and well-being are affected, it influences the physical body. When workers are ill of whatever reason, their productivity at work will be reduced. If the worker is too ill to attend work, there are the absenteeism-associated costs of recruiting and getting a replacement worker, training that worker, and possibly facing decreased quality or quantity of job from that alternative. If the sick worker is present at work in spite of the illness, which called "presenteeism," that defines the lowered productivity of a person who is either physically or mentally ill, and as a result not as efficient as he or she would usually be. The employer has to pay for both cases. Various circumstances in the workplace can be described "psychosocial hazards" as they are associated to the psychological and social contexts of the workplace instead of physical contexts, and they can be damaging to mental (and physical) health of employees. These are sometimes denoted to as *work stressors*. Besides increasing overall mental health and well-being, such attempts can also aid to increase the productivity of the workers and lower the increasing costs of insurance claims for physical and mental health illnesses. Employees showing signs of mental illnesses or disorders will have undesirable qualities that influence productivity and quality of job, consequently directly affecting the organization. Impaired mental health and/or job dissatisfaction linked to work-family conflict also has a significant influence on productivity at work, particularly associated to absenteeism and intention to quit. Study reveals that employees facing high work-family conflict display up to 13 times as much nonattendance, and have a 2.3 times greater intention of resigning^[54].

Ensuring health by eliminating hazards in the workplace, and accordingly preventing disease, does not ensure that employees will have optimum health. A worker's health is also affected by his or her own health practices. Study has indicated that smoke-free workplaces are linked with a decrease daily cigarette smoking by workers, and a lowered prevalence of smoking^[55], and on the other hand, that build up workplace stress can contribute to a rise in cigarette smoking^[56]. This is an example of an evidence of how a workplace influences personal health behaviour. Furthermore, energy used during working periods is negatively related with physical activity during leisure time^[57]. It is relatively evident that work be able to, and does, have an effect on individuals' health choices that can add to risk factors for acute and chronic, communicable and non-communicable diseases. The work-related factors that affect an employee's ability to take up a healthy lifestyle are not gender neutral at all times. Females are disposed of to having jobs with a less degree of decision latitude^[58], so that even when flexibility is given to make available allow time for workout, females may not have as much actual leeway as males. Moreover, it is well understood that females who work outside the home usually do more unpaid labour in the house, before and after work, than males' do^[59]. Another noteworthy perspective examines the interrelationships between risk factors in the workplace setting and personal risk factors. For instance, obesity has a complex relationship with occupational hazards. Schulte et al. (2008) mention that obesity "has been found to have an effect on the relationships between exposures to occupational hazards and disease or injuries and

may also exist as a co-risk factor for them ^[60]. Inversely, workplace hazards may have an effect on obesity-disease associations; exist as one of the co-risk factors for disease, injuries, or obesity. Disease risk may also be affected by workplace design, work organization, and work culture.

V. CONCLUSION

Delay in receiving care for health problems can be costly and dangerous, it is necessary to increase awareness and to health educate people on this problem. It is necessary to increase awareness on personal safety at the workplace and the relation to health as the delay in seeking treatment or care for occupational health problems might be costly and dangerous. According to a study conducted by Brosseau and Li (2005) ^[61], owners of small enterprises believe that by improving health and safety at work will make employees feel healthier, happier, and attentive towards work; reduce the cost of compensation, and increase the efficiency of the workforce. This in turn lowers the organisations' expenditure and producing higher quality products. Owners that have a higher attitude and intentions toward health and safety have higher probability of paying attention to employees' wellbeing at the workplace. A study done by Muñiz et al. (2014) ^[62] demonstrated that proactive risk management and transformational leadership in safety behavior promotion is important as the improvement safety outcomes is associated to employees' safety behavior. The results gave organizations the aspects that should be encouraged in reducing risks and increase safety performance. There are various individual factors that need to be studied in order to understand and improve health-related behaviour. Although policies, laws, and regulations can impact on health behaviours, it is crucial to examine health-related behaviour for the future of public health and the well-being of individuals and this become the basis for public health activities and efforts (Glanz, Rimer, & Lewis, 2002) ^[10]. The benefits of positive change should be recognised and promote with the aim of attracting participants along the stages of change and by allowing for changes in public health programs particularly in work safety education and environmental support in order to help individuals to maintain changes. Most individuals have performed a period of less than optimal health behaviours and hence it is not rational to assume that momentous and permanent changes will take place within a short time frame as change is incremental.

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AUTHORS

First Author – Huinee Voon, BSc. Cognitive Sciences, Universiti Sultan Zainal Abidin. Email: voon987@yahoo.com

Second Author – Prof. Dr. Tengku Mohammad Ariff, PhD, Universiti Sultan Zainal Abidin. Email: tengku.ariff@yahoo.com

Correspondence Author – Huinee Voon, voon987@yahoo.com, bevail@yahoo.com, +601137829001.

Vulnerability of Maize Production to Climate Change in Maize Producing Counties of Rift Valley Kenya: The Indicator Approach

Masambaya F. N. *, Oludhe C.*, Lukorito C. B.* and Onwonga, R.**

*Department of Meteorology, University of Nairobi

**Department of Land Resource Management and Agricultural Technology, University of Nairobi

Corresponding Author

Fredrick N. Masambaya

P.O. Box 373, 00100

Email: masaafred@gmail.com

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Abstract

Efforts towards attainment of sustainable economic growth and food security in Kenya are under increasing threats due the adverse effects of climate change. This study therefore, sought to assess the vulnerability of maize production to climate change in major maize producing counties of Kenya's Rift Valley region, using the indicator approach. Climate data including monthly rainfall, maximum and minimum temperature was obtained from Kenya Meteorological Department. The Sen's Slope Estimator was used to determine the rate of change of rainfall and temperature (1981-2010), which constituted the exposure indicators. The Standardized Precipitation Index (SPI) was used to determine the frequency of extreme climate events that formed part of exposure variables. As for the socioeconomic and biophysical data sets, sensitivity indicators included demographic and ecological sensitivity variables while adaptive capacity variables encompassed social capital, literacy rate, financial capital and physical capital. Sensitivity and adaptive capacity data was obtained from Kenya Bureau of Statistics, Ministry of agriculture and Fisheries and Tegemeo Institute of Agricultural Policy and Development. After normalization, Principal Component Analysis (PCA) was used to assign weights to the indicators. Subsequently, the normalized values of each variable were multiplied with their respective weights as obtained from PCA and later aggregated to obtain Exposure, sensitivity, adaptive capacity and vulnerability indices

Trans Nzoia had the least exposure index (0.19) and second highest adaptive capacity(2.59) which made it record the lowest vulnerability index of -0.212. Narok recorded the highest vulnerability index of 1.51 with the peak exposure (1.03) and least adaptive capacity (-2.28). Nakuru had the second highest vulnerability index (0.35) while Uasin Gishu recorded the second least vulnerability index (-0.12). Generally, counties with considerable socioeconomic development recorded high adaptive capacity which reduced their vulnerability significantly. Hence, in order to cushion most vulnerable maize producing counties, climate change policies and strategies should prioritize adaptive capacity enhancement through socio economic development initiatives such as irrigation, rural infrastructural development and educational programs.

Key words: *Vulnerability Assessment, Climate Change, Indicator Approach*

1.0 INTRODUCTION

Over the last three decades, the earth's surface has successively been warming up at the highest rate compared to the preceding decades since 1850. The Fifth Assessment Report by Intergovernmental Panel on Climate Change (IPCC), shows that the global averaged land and ocean surface temperature increased by 0.85°C (0.65°C - 1.06°C) from 1880 to 2012 (Pachauri *et al.*, 2014). In comparison to the base period between 1986 and 2005, the increase in global mean surface temperature by the end of the century has been projected to be in the range of 0.3°C to 4.8°C (Pachauri *et al.*, 2014).

Climate change is largely driven by the increasing emission of greenhouse gases (GHGs) that emanate from anthropogenic activities (Parry, 2007; Stocker *et al.*, 2013). Although there are concerted efforts to reduce the emission of GHGs, global

temperatures are still expected to continue increasing and therefore there is urgent need to explore mechanisms for adapting to the continuing change in climate, specifically for developing countries which face the biggest brunt of the adverse impacts of climate change (Ahumada-Cervantes *et al.*, 2015).

The high temperatures and increased frequency of extreme weather events due to climate change, are bound to jeopardize agricultural production and as a result compromise food security in Africa (Conway, 2009). Climate change will significantly reduce cereal crop yields in Africa by increasing water stress, decreasing the length of the growing season and escalating the frequency of pest, disease and weeds prevalence (Niang *et al.*, 2014). Since 1960, the mean temperatures in Kenya have increased by about 1⁰C, representing approximately 0.21⁰C increase per decade. Warming has increased by 0.29⁰C during the hotter months (December-January-February) and by 0.25⁰C during the cooler months (June-July-August). Observations show that rainfall has increased during the short rainy season (October-November-December), while the long rainy season (March-April-May) has recorded decreased rainfall and also become less reliable (Parry *et al.*, 2012). Various studies have been carried out to assess the impact of climate change on maize production in which revealed that rising temperatures during the long rainy season (March to May) shortened crop growth stage and reduced maize yields, hence revenue from maize decreased (Wandaka, 2013). Maize production is expected to decrease by 23% by 2100 based on simulations from climate scenarios (Wandaka, 2013).

Maize is Kenya's staple food and accounts for more than one third of the caloric intake for the population (Ariga *et al.*, 2010; Wandaka, 2013). As a result, the availability of locally produced maize considerably determines Kenya's food security both nationally and at the household level. It is predicted that by the year 2020, yields resulting from rain fed maize farming will decline by half (Ojwang *et al.*, 2010). The negative impacts of climate change have significantly reduced maize production locally and hence jeopardized Kenya's policy on food (Mati, 2000).

The importance of vulnerability assessments in shaping adaptation to impacts of climate change has been underscored in recent studies conducted worldwide (Heltberg & Bonch-Osmolovskiy, 2011; Monterroso *et al.*, 2014). The studies have shown that mapping of vulnerability and its components constitutes an integral part in providing information to policy makers and stakeholders so as to appropriately envisage the impacts of climate change and support effective risk management and spatial planning (Preston *et al.*, 2011; López-Carr *et al.*, 2014). Therefore, formulation of policies and strategies to adapt to and mitigate adverse impacts of climate change on maize production should be founded on the basis of scientific vulnerability assessments.

Of the few studies done on vulnerability to climate change in Kenya (Mwangi & Mutua, 2015; Opiyo *et al.*, 2014; Yohe *et al.*, 2006), none has focussed on maize production. This study therefore, seeks to bridge this gap by assessing the vulnerability of maize production to climate change in the Rift Valley's major maize growing counties using the indicator approach.

1.1 Vulnerability Context

In this study, the definition given by IPCC was adopted as a basis for vulnerability assessment. According to IPCC's Third Assessment Report, vulnerability is defined as the degree to which a system is susceptible to or unable to cope with adverse effects of climate change including climate variability and extremes (McCarthy, 2001). Vulnerability is a function of exposure, sensitivity and adaptive capacity. The nature and extent to which climatic variations affect a system is called exposure (Parry, 2007). The degree of beneficial or adverse impacts of climate change on a system is referred to as sensitivity (Parry, 2007). Adaptive capacity refers to the capability of a system to adjust in order minimize probable harm, take advantage or cope with consequences of climate change, variability and extremes (Parry, 2007).

This study used the integrated approach which is an aggregate of biophysical and socio-economic approaches because it is best suited for policy making process (Rama Rao *et al.*, 2016 ; Deressa *et al.*, 2009). The indicator method was used for vulnerability assessment in this study because it selected a set of potential indicators and then merged them analytically, so as to show the degree of vulnerability and nature of vulnerability in a form that is comprehensible (Leichenko & O'Brien, 2002).

2 MATERIALS AND METHODS

2.1 Area of study

The study was conducted within the major maize producing counties of the Rift Valley region of Kenya comprising Uasin Gishu, Trans Nzoia, Narok, and Nakuru Counties (Figure 1).

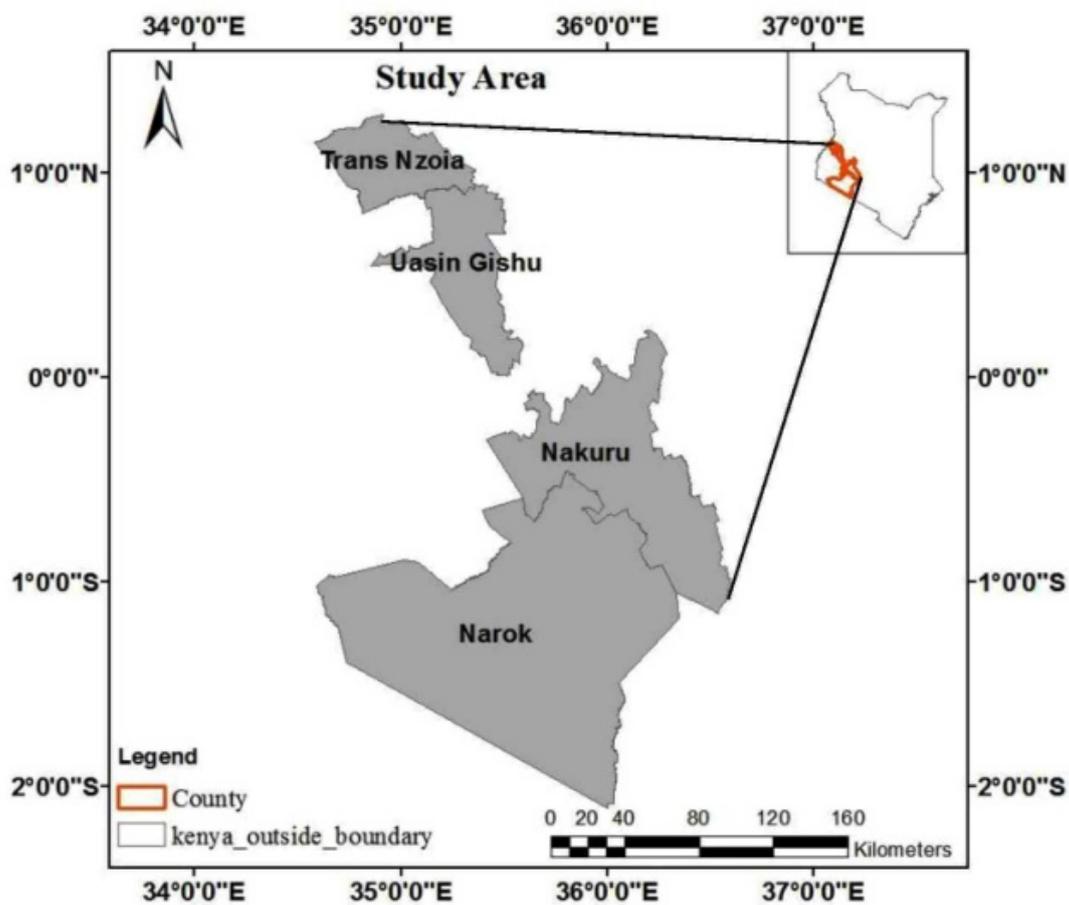


Figure 1: Map of Study area

Uasin Gishu County lies between longitudes $34^{\circ} 50''$ East and $35^{\circ} 37''$ West and latitudes $00^{\circ} 03''$ South and $00^{\circ} 55''$ North and has a total area $3,327 \text{ km}^2$ (Osundwa *et al.*, 2013). Its altitude ranges between 1500 metres and 2700 metres. The mean annual rainfall of the county ranges from 624.9mm to 1560.4mm. The dry spells commence in November and end in February. Temperatures range from 8.4°C to 26.1°C with a mean of 18°C (Korir, 2011). The main crops grown in the county are maize, sunflower, wheat, pyrethrum, potatoes and barley. The population of the county stood at 894,179 in during the 2009 Census (Korir, 2011; Osundwa *et al.*, 2013; Uasin Gishu County Government, 2013).

Trans Nzoia County has an area of 2,467 km² and an average altitude of 1800 metres. Its coordinates lie between latitude 00 38'' and 10⁰ 18'' North of the equator and longitudes 34⁰ 38'' and 35⁰ 23'' East. The county receives a mean annual rainfall of 1,296.1mm and a mean temperature of 18.6⁰C. Maize production is the main farming activity and accounts for the greatest acreage of arable land. By the year 2009, the total population of Tran Nzoia was 818, 757 (Mungo, 2014; Trans Nzoia County Government, 2013).

Nakuru County has an area coverage of 7,495.1 km² and an altitude of 2,000 metres (Nakuru County Government, 2013). It lies between longitude 35⁰ 28'' and 35⁰ 36'' East and latitude 0⁰ 13'' and 1⁰10'' south (Sangori, 2012) . The county experiences high temperatures of 29⁰C (December-January-February) and low temperatures of 12⁰C (June-July). Most farmers in the county grow wheat, maize and horticultural crops (Dennis, 2010). By the year 2009, the population of the county was 1,603,325 people (Nakuru County Government, 2013)

Narok County lies between latitudes 0⁰ 50'' and 1⁰ 50'' South and longitude 34⁰ 28'' and 36⁰ 25'' East and has an area coverage of 17,944 km². Its average elevation is 1827 metres above sea level. The population of the county in the year 2012 was estimated to be 850,920. Generally the county receives a mean annual rainfall ranging from 500mm to 1800mm with temperatures ranging from 12⁰C to 28⁰C. Crops that are mainly grown in the county include barley, wheat, maize, beans, and Irish potatoes. Out of these crops, the highest revenues are realized from maize and wheat that are widely grown by most of the farmers in the county (Narok County Government, 2017)

2.2 Data types and sources

Vulnerability indicators were chosen considering: suitability of the indicator in terms of its theoretical basis in the framework of vulnerability, definite direction of influence between the indicator and vulnerability and its ability to measure what it should measure adequately, and easy access to data on the indicator (Gbetibouo *et al.*, 2010). Monthly temperature and rainfall data during the baseline period (1981-2010) for Eldoret, Kitale, Nakuru and Narok meteorological stations representing Uasin Gishu, Trans Nzoia, Nakuru and Narok Counties respectively, were obtained from the Kenya Meteorological Department.

The study also used data on socioeconomic and biophysical indicators; exposure indicators including rates of change of rainfall, minimum and maximum temperature, frequency of droughts and floods; sensitivity indicators comprising ecological sensitivity (the percentage dependency on rain-fed agriculture, total annual maize production, maize yields per hectare and agricultural area under maize production) and demographic sensitivity (density of rural population, percentage of farmers who practice maize farming and people living under poverty line); adaptive capacity indicators including social capital (share of farmers in farm organisations), literacy rate, financial capital (percentage of farmers who saved money, off farm income, farm income, holding size farm land, farm assets, net house hold income, remittances and access to credit) and physical capital (distance to motorable roads, distance to National Cereals and Produce Board (NCPB) depot, distance to tarmac road, distance to farm produce market, use of chemical fertilizers, rate of irrigation and use of improved seeds). The data on sensitivity and adaptive capacity was obtained from Kenya Bureau of Statistics, Ministry of agriculture and Fisheries and Tegemeo Institute of Agricultural Policy and Development.

2.3 Methodology

2.3.1 Determination of rates of change of meteorological parameters

The rates of change of temperature and rainfall were computed using the non-parametric method developed by Sen in 1968 (Drápela & Drápelová, 2011; Gocic & Trajkovic, 2013). Based on this methodology, a linear model can be illustrated using equation 1

$$f(t) = Qt + K \tag{1}$$

Where Q is the slope

K is the constant

In order to estimate the slope, Q, a computation of slopes for all data pairs was carried out using equation 2.

$$Q_i = \frac{x_j - x_k}{j - k} \tag{2}$$

Where $i=1,2 \dots N, j>k$

For n values of x , the number of slopes that would estimate Q_i was given by equation 3.

$$N = \frac{n(n-1)}{2} \tag{3}$$

Where N , is the number of slopes required and n is the total number of data sets.

The N values of Q_i were ranked in ascending order of magnitude and the slope median (Sen’s slope estimator) calculated based on the criteria in equation 4.

$$Q = \begin{cases} Q_{\frac{N}{2}} & \text{if } N \text{ is odd} \\ \frac{1}{2}(Q_{N/2} + Q_{N+2/2}) & \text{if } N \text{ is even} \end{cases} \tag{4}$$

The rate of change of rainfall and temperature were used as exposure variables in the computation of exposure and vulnerability indices. Standard precipitation Index was used to analyse observed rainfall data of each station so as to get the frequency of droughts and events that were anomalously wet. The rainfall data for the meteorological stations was subjected to a 3 month- SPI computation using a program provided by the World Meteorological Organisation that is recommended for calculation of SPI (Svoboda *et al.*, 2012). The results from analysis were compared to the SPI table value to determine the number of values that corresponded to extremely wet and extremely dry categories (Svoboda *et al.*, 2012).

Table 1: Standard Precipitation Index values

2.0 +	Extremely wet
1.5 to 1.99	Very wet
1.0 to 1.49	Moderately wet
-0.99 to 0.99	Near normal
-1.0 to -1.49	Moderately dry
-1.5 to -1.99	Severely dry
-2 and less	Extremely dry

2.3.2 Determination of Vulnerability Indices

Data for variables which were clustered under respective components of vulnerability were normalized using methodology by UNDP (2012) to eliminate differences in scales and ensure comparability(Vincent, 2004). When vulnerability increased with increasing indicator, normalization was done using equation 5.

$$X_{normalized} = \frac{X_{ij} - \text{Min}X_{ij}}{\text{Max}X_{ij} - \text{Min}X_{ij}} \quad \{5\}$$

Conversely, if vulnerability decreased with increasing specified indicator, then normalization was done using equation 6.

$$X_{normalized} = \frac{\text{Max}X_{ij} - X_{ij}}{\text{Max}X_{ij} - \text{Min}X_{ij}} \quad \{6\}$$

Where X_{ij} is the i^{th} indicator for the j^{th} county

Normalization of the data was followed by ranking of the indicators where unequal weights were assigned to each of them because the indicators do not contribute equally to vulnerability(Hebb & Mortsch, 2007). The weights for the indicators were generated using Principal Component Analysis(PCA) that assisted in extracting few orthogonal linear combinations of variables that most successfully captured the common information from the study variables(Gbetibouo *et al.*, 2010).

For a set of N variables (a_{1j} to a_{nj}), the PCA was used to normalize each variable using its average and standard deviation(Deressa, 2010)

$$a_{1j} = \frac{a_{1j} - a_{1.}}{s_{1.}} \quad \{7\}$$

where $a_{1.}$ is the mean of a_{1j} across region and its standard deviation is $s_{1.}$

A linear combination of a set of core components for each county, j, was used to express the selected variables(Deressa *et al.*, 2008; Deressa, 2010) as given in equation 8 and 9.

$$a_{1j} = V_{11}A_{1j} + V_{12}A_{2j} + \dots + V_{1N}A_{Nj}, \quad j=1, \dots, j \quad \{8\}$$

$$a_{Nj} = V_{N1}A_{1j} + V_{N2}A_{2j} + \dots + V_{NN}A_{Nj} \quad \{9\}$$

Where, A's are the components and V's are the coefficients of each component for each variable.

Since only the left hand side of equation 8 and 9 is known, the solution to this equation is undefined. To surmount this shortcoming, the PCA was used to determine the linear combination of the variables with maximum variance that gave the first principal component, A_{1j} . Subsequently, the second linear combination of variables orthogonal to the first were determined, with the maximum remaining variance giving rise to the second principal component, A_{2j} and so on. This procedure theoretically solved for v_n and λ_n in equation 10.

$$(R - \lambda I)v_n = 0 \quad \{10\}$$

R is the matrix of correlations between the n^{th} components for each variable and solving equation 10 gives a solution for λ_n (the Eigen values), the characteristic root of R, and associated eigenvectors, v_n . Scaling the v_n s so that the total of their square adds up to the total variance, produces the final set of estimates. This is another restriction that was imposed to achieve determinacy of the problem(Deressa, 2010).

Equation 8 and 9 implies inverting of the system which allows for the recovery of the scoring factors from the model. Consequently, a set of estimates for each K principal components was obtained as follows:

$$A_{1j} = f_{11}a_{1j} + f_{12}a_{2j} + \dots + f_{1N}a_{Nj} \quad \{11\}$$

$$A_{k1j} = f_{N1}a_{1j} + f_{N2}a_{2j} + \dots + f_{NN}a_{Nj} \quad \{12\}$$

Based on the expression below, the first principal component, expressed in terms of the original (un-normalized) variables, that gives an index for each household was obtained based on equation 13.

$$A_{1j} = \frac{f_{11}(a_{1j}^* - a_{1-}^*)}{S_1} + \dots + \frac{f_{12}(a_{Nj}^* - a_{N-}^*)}{S_N} \quad \{13\}$$

The weights obtained from first principal component were multiplied by their respective normalized values of each variable under the three components of vulnerability. Thereafter, the products were summed up and divided by the total weight of variables under each vulnerability component as illustrated in equations 14 to 16(Emebet, 2013).

$$E_c = \frac{\sum_i^j p_i Y_E}{\sum_i^j p_i} \quad \{14\}$$

$$S_c = \frac{\sum_i^j p_i Y_S}{\sum_i^j p_i} \quad \{15\}$$

$$AC_c = \frac{\sum_i^j p_i Y_{AC}}{\sum_i^j p_i} \quad \{16\}$$

Where:

- AC_c is the adaptive capacity of the County
- S_c is the sensitivity of the County
- E_c is the exposure of the county
- Y_E, Y_S and Y_{AC} are standardized values of variables under exposure, sensitivity and adaptive capacity respectively.
- P_i is the weight of the indicators.

The vulnerability index of the counties(VI_c) was computed by getting the sum of S_c and E_c and then subtracting AC_c . using the method adopted from(Ahumada-Cervantes *et al.*, 2015) given in equation 17.

$$VI_c = \frac{E_c + S_c - (1 - AC_c)}{3} \quad \{17\}$$

Where:

- VI_c is the vulnerability of the county
- AC_c is the adaptive capacity of the county
- S_c is the sensitivity of the county
- E_c is the exposure of the county

PCA was run in SPSS software so as to generate the weights of variables clustered under each vulnerability component.

In order to represent the vulnerability of each county on a map, vulnerability indices were normalized further so as to get the final value on a scale of 0-5(Ravindranath *et al.*, 2011) using equation 18.

$$VI_{normalized} = 5 \left(\frac{VI - VI_{min}}{VI_{max} - VI_{min}} \right) \quad \{18\}$$

Five categories were created to classify the normalized VIs which included very high ($4 \leq VI_{normalized} < 5$), high ($3 \leq VI_{normalized} < 4$), moderate ($2 \leq VI_{normalized} < 3$), low ($1 \leq VI_{normalized} < 2$) and very low ($0 \leq VI_{normalized} < 1$). The $VI_{normalized}$ values were plotted using GIS (Ahumada-Cervantes *et al.*, 2015) in order to generate the spatial patterns of vulnerability for each study county

3. RESULTS AND DISCUSSION

3.1 Exposure, Sensitivity, Adaptive Capacity and Vulnerability Indices

The PCA analysis resulted into three major principal components whose Eigen values were greater than one. These components explained 100% of the variation in the data set with 51.2%, 25.3% and 23.5% of the variation being accounted for by the first, second and third component respectively. The first principal component obtained from PCA for a given set of vulnerability indicators is considered to be the linear index of all indicators that successfully denotes the maximum information that is in all variables (Gbetibouo *et al.*, 2010). The weights of the vulnerability indicators from the first principal were multiplied by their respective normalized values and later aggregated to obtain the indices. The exposure, sensitivity, adaptive capacity and vulnerability indices for each of the study counties are given in Table 1.

Table 2: Exposure, Sensitivity, Adaptive capacity and Vulnerability indices

County	Exposure Index	Sensitivity Index	Adaptive Capacity Index	Vulnerability Index
Nakuru	0.48	0.71	1.13	0.35
Narok	1.03	0.21	-2.28	1.51
Trans Nzoia	0.19	0.75	2.58	-0.21
Uasin Gishu	0.61	0.64	2.60	-0.12

3.1.1 Exposure Indices

The exposure indices for the counties ranged from 0.19 to 1.03 (Table 16, Figure 29). Narok had the highest exposure index of 1.03 while Trans Nzoia emerged as the least exposed county with an index of 0.19. (Figure 2).

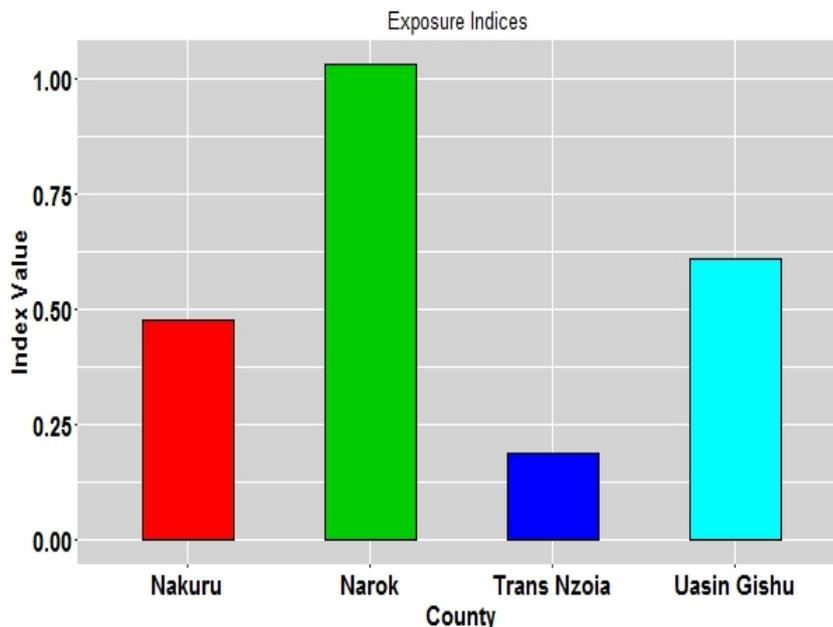


Figure 1: Bar plots of Exposure indices.

The second and third highest exposure indices were recorded in Uasin Gishu (0.61) and Nakuru (0.48) respectively. The growth and development of crops is highly dependent on prevailing climate conditions (temperature and rainfall patterns) and extreme weather events (Li *et al.*, 2015). Climate change exacerbates the exposure of farmers by triggering new and unknown alterations

in temperature and rainfall patterns including increased recurrence rate of droughts and floods (Gbetibouo *et al.*, 2010). In comparison, temperature affects maize production to a greater extent than precipitation (Kabubo-Mariara & Karanja, 2007). Evidently, Narok recorded the highest change rate of maximum temperature ($0.056^{\circ}\text{C}/\text{year}$) and minimum temperature ($0.055^{\circ}\text{C}/\text{year}$). Also, it recorded a total of five floods and six droughts during the baseline period. Trans Nzoia registered the second highest change rates of maximum temperature and minimum temperature of $0.054^{\circ}\text{C}/\text{year}$ and $0.049^{\circ}\text{C}/\text{year}$ respectively. A total of three droughts and five floods were observed in the county between 1981 and 2010.

Evidently, the peak exposure index realized in Narok was as a result of its high temperature variation which was highest among the four counties. Additionally, the considerably high frequency of extreme weather events contributed significantly to the peak exposure index in the county. Although Trans Nzoia had the second highest change rates in maximum and minimum temperature, it emerged as the least exposed county due to least frequency of droughts and floods during the baseline period. The least change rates of maximum temperature ($0.051^{\circ}\text{C}/\text{year}$) and minimum temperature ($0.045^{\circ}\text{C}/\text{year}$) were observed in Nakuru County. Uasin Gishu had the same rate of change of minimum temperature with Trans Nzoia ($0.046^{\circ}\text{C}/\text{year}$) and the third highest minimum temperature change rate ($0.046^{\circ}\text{C}/\text{year}$). Notably, Nakuru and Uasin Gishu recorded the highest number of droughts (6) and floods (7). Uasin Gishu and Nakuru recorded higher exposure indices than Trans Nzoia due to their peak frequency of extreme weather events. The results obtained in this study for exposure indices agree with the observation made by (Gbetibouo *et al.*, 2010) that farming areas with high variability in climate patterns and peak occurrence rate of extreme weather events are likely to be highly exposed to climate change.

3.1.2 Sensitivity Indices

Sensitivity indices for the study counties ranged from 0.21 to 0.75 (Figure 3). Trans Nzoia emerged as the most sensitive county with an index of 0.75. The minimal sensitivity was recorded in Narok County with a value of 0.21. The second highest and the second least sensitivity indices were recorded in Nakuru (0.71) and Uasin Gishu (0.64) respectively. Trans Nzoia recorded the highest percentage of farmers who practiced maize production (98%), density of rural population ($328\text{people}/\text{km}^2$), percentage of people living under poverty line (50.1%) and absolute reliance of maize production on rainfall (100%).

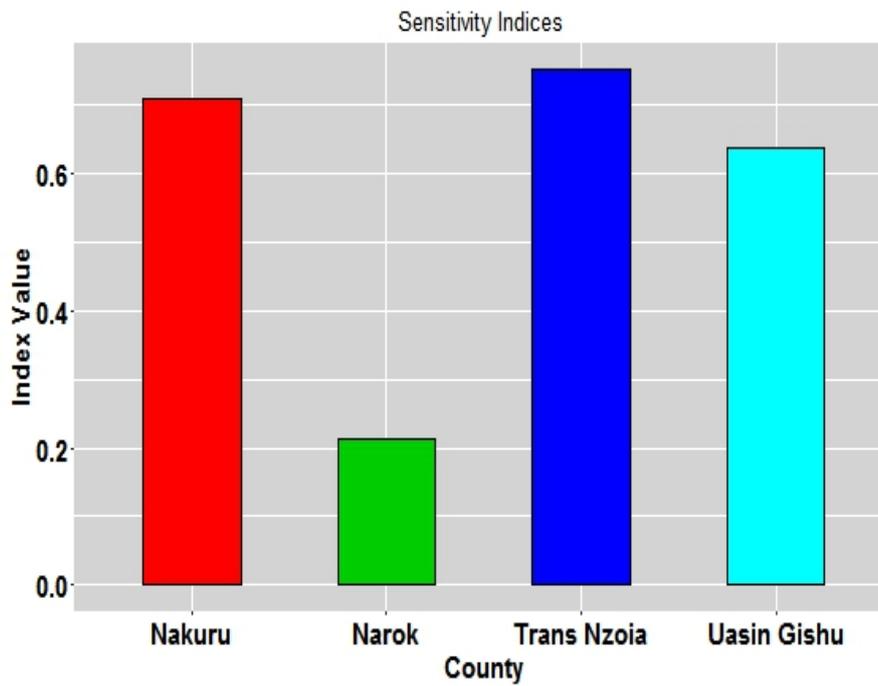


Figure 3: Bar plots of Sensitivity indices

As a result, more people were at the risk of being adversely affected by change in climate and hence exhibited higher sensitivity levels. Narok recorded the least density of rural population (48people/km²), percentage of farmers who practiced maize production (85.7%) and percentage of people living under poverty line (33.7%). Thus fewer people were exposed to impacts of climate change hence the minimal sensitivity recorded in the county.

The results in this study were consistent with research findings by (Yusuf & Francisco, 2009) and (Hegglin & Huggel, 2008) on sensitivity. These studies found out that the degree of sensitivity was dependent on the number of people that were at risk of being affected by climate change. Nakuru had a lower percentage of rural population density, people living under poverty line and maize farmers compared to Uasin Gishu. However, the percentage dependency of maize production on rainfall was 100% in Nakuru and 99% in Uasin Gishu. Therefore, farmers in Uasin Gishu were not entirely dependent on rainfall for maize production and could lessen the impacts of climate change induced water stress by using irrigation which reduced their sensitivity. This is in line with findings by (Emebet, 2013) who stated that sensitivity to temporary rainfall variability would be reduced by irrigation in a given area.

3.1.3 Adaptive Capacity Indices

The adaptive capacity indices for the study counties are presented in Figure 4.

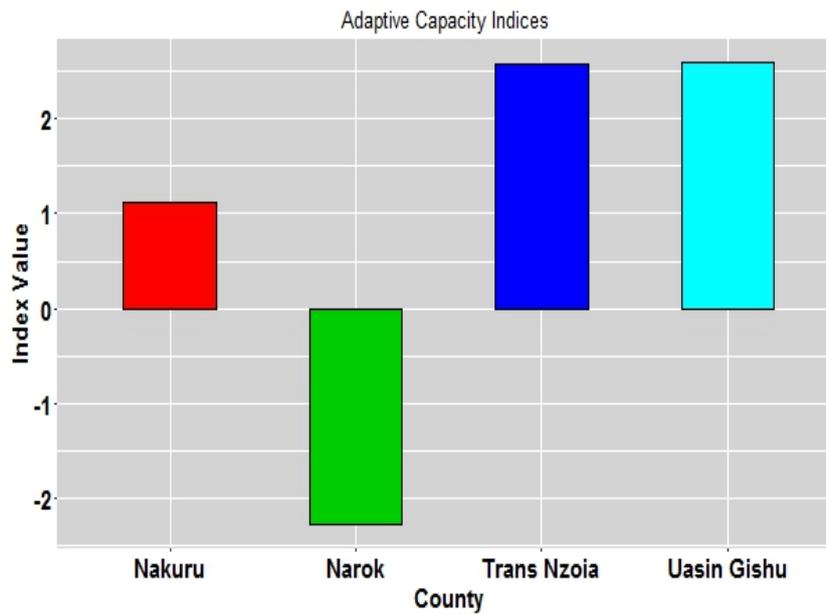


Figure 4: Bar plots of Adaptive Capacity indices

Narok had the minimal adaptive capacity index of -2.28. Not only did Narok record the least percentage of farmers in agricultural organisations (33.3%) but it also had the lowest literacy rate among maize farmers (53.7%). Membership of farmers in agricultural organisations creates a societal network that acts as a platform that facilitates cash flow and transfers which eliminates financial barriers for farmers (Deressa *et al.*, 2008). Also, literacy rates determine the ability of farmers to access knowledge and information and hence improve their coping capability to unfavourable consequences of climate change (Brooks *et al.*, 2005). As a result, in Narok, fewer farmers accessed climate change information and were not able to fully understand, interpret and implement it to improve maize production, hence the low adaptive capacity realized in the county.

The wealth status of farmers can be ascertained by considering the value of farm assets, farm, off farm and net income. Such wealth enables farmers to access resources like markets and technology which are vital in improving their adaptive capacity (Brenkert & Malone, 2005). The net income that accrued from farm and off farm activities was least in Narok County. Therefore, the maize farmers lacked financial capacity to adapt to impacts of climate change. For farmers to access markets to sell their produce, there must be quality and dense infrastructure network in form of roads and other transport routes (Adger *et al.*, 2004). Narok had the furthest distance to farm produce outlets, NCPB depots, motorable and tarmac roads. As a result, farmers incurred higher costs in transporting their maize to nearest markets which reduced their revenue considerably and made them more vulnerable to climate change. Although 100% of farmers in the county used improved seeds, lack of irrigation and low usage of chemical fertilizers limited the total annual maize yields which translated to lesser farm income for the maize farmers in Narok.

The peak adaptive capacity during the baseline period was recorded in Uasin Gishu (2.60). It had the highest farm asset value, farm, off farm and net incomes among the four counties. Therefore, in the face of climate change impacts, maize farmers in this county were able to promptly address financial constraints posed by erratic climate patterns. Out of all maize farmers in the county, 91% were literate, 53.1% were members of agricultural organisations and 59.4% saved their income. This meant that a greater portion of maize farmers had access to climate information and could understand, interpret and implement the information for improvement of maize production against a wave of changing climate patterns. Besides, the farm produce markets were closer to farmers in Uasin Gishu and therefore more farmers were able to sell their produce without incurring a lot on transport expenses. The second and third highest adaptive capacity were recorded in Trans Nzoia (2.58) and Nakuru (1.13) respectively.

3.1.3 Vulnerability Indices

The vulnerability indices for the study counties ranged from -0.12 to 1.51 (Table 16). Trans Nzoia had the lowest vulnerability index value of -0.21. Although the county was the most sensitive, its least exposure contributed negligibly to the potential impact of climate change. The county had the second highest adaptive capacity index (2.58) which reduced its vulnerability considerably. Uasin Gishu County recorded a vulnerability index of -0.12 making it the second least vulnerable county. Much as the highest adaptive capacity was realised in this county, the combined effect of its sensitivity and exposure created a greater climate change potential impact and hence increased its vulnerability. Narok registered the highest vulnerability index of 1.51. This is because the significant values of exposure index recorded in the county, contributed greatly to potential impacts of climate stressors and hence increased its vulnerability to a great extent. Moreover, its negative adaptive capacity index meant that the county lacked capability to adjust in order to minimize probable harm, take advantage or cope with consequences of climate change and extremes events. The second most vulnerable county was Nakuru with a vulnerability index of 0.35.

The overall vulnerability is a function of magnitude of exposure, sensitivity and adaptive capacity for the system or area under study (Ezra, 2016; Yusuf & Francisco, 2009). Areas that are highly exposed to climate change and have low adaptive capacity depict peak vulnerability levels (Li *et al.*, 2015). Narok recorded the least vulnerability index because it had the least adaptive capacity and highest exposure. Highly exposed areas or communities do not necessarily have low adaptive capacity or high sensitivity to climate change (Gbetibouo *et al.*, 2010; Islam *et al.*, 2014). As much as Narok was the most exposed county, it registered the least sensitivity and adaptive capacity index. Also, Trans Nzoia was the most sensitive county, but had the second highest adaptive capacity. Vulnerability increases when sensitivity and exposure increases, but reduces as adaptive capacity increases and vice versa (Ahumada-Cervantes *et al.*, 2015). The vulnerability in Trans Nzoia and Uasin Gishu was considerably reduced by significant adaptive capacity realized in the counties. The sensitivity and exposure of Uasin Gishu (potential impact) was higher than in Trans Nzoia. This had an increasing effect on the vulnerability in Uasin Gishu although it had the highest adaptive capacity. The high exposure index in Narok increased its vulnerability considerably while the negative adaptive capacity was inconsequential in reducing peak vulnerability in the county.

3.1.4 Vulnerability Maps

Three categories of vulnerability for each study county were identified and mapped (Figure 5). Trans Nzoia County was classified under the very low category ($0 \leq VI_{\text{normalized}} < 1$) since its normalized vulnerability index was 0. Uasin Gishu scored a normalized vulnerability index that lay between 1 and zero (0.3) and therefore was clustered under the same vulnerability class as Trans Nzoia. The vulnerability in Nakuru was classified as low ($1 \leq VI_{\text{normalized}} < 2$) due to its normalized vulnerability index of 1.6, while Narok had a normalized vulnerability index of 5 and therefore was classified under very high category of vulnerability ($4 \leq VI_{\text{normalized}} < 5$).

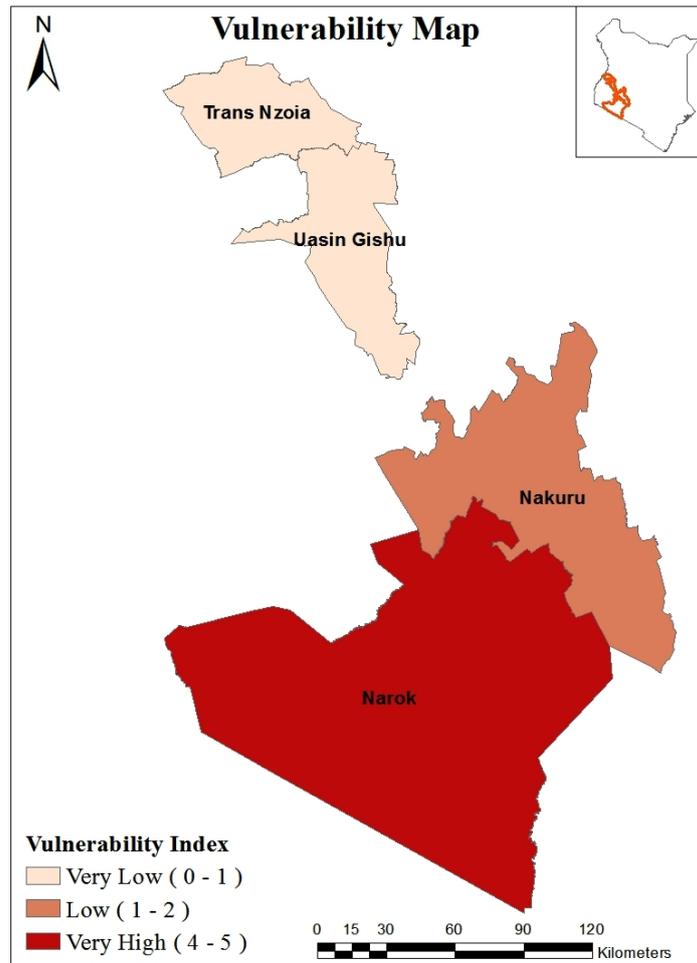


Figure 5: Vulnerability map

4. CONCLUSIONS

Although Trans Nzoia had the highest sensitivity, it emerged as the least vulnerable county as it recorded the least exposure and the second highest adaptive capacity. Due to its negative adaptive capacity index, Narok lacked any ability to withstand or cope with the negative impact of climate stressors. As a result, it recorded the highest vulnerability index despite having the least sensitivity. The second and third highest vulnerability indices were realized in Eldoret and Nakuru respectively. Trans Nzoia and Uasin Gishu exhibited propensity levels that were classified as very low and therefore had the lowest degree to which climate change would negatively impact maize production in the counties. The vulnerability in Nakuru was higher as compared to Uasin Gishu and Trans Nzoia and therefore maize production was at a higher risk of being adversely impacted by climate change. Narok was the most vulnerable county and hence maize production in the county was highly predisposed to adverse impacts of climate change as compared to the other counties.

There is a need to delink maize production from rainfall dependency. Therefore, irrigation using harvested rainfall, surface and ground water should be implemented in all counties in order to suppress the negative impacts on maize production during drought and rainfall depressed seasons.

It was noted that socioeconomic development played a pivotal role in enhancing the adaptive capacity which in turn reduced the vulnerability of the counties considerably. Therefore, in order to curb the high vulnerability in highly vulnerable counties, climate

change policies should prioritize socioeconomic development initiatives like rural infrastructural development and educational programs to improve literacy levels.

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A Comparative Analysis of Public and Private School Based on Demand and Supply – A Micro Analysis of Thrissur District in Kerala

Haritha C.J

M.A ECONOMICS, UGC-NET, KERALA, INDIA

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Abstract: Education of the people is the basic objectives of development, it is the important ends in life. The educational systems of many developing nations sometimes act to increase rather than to decrease income inequalities. The issue of private versus public education has been of great significance in developing countries. Public school refers to which are owned managed & financed by the state. On the other hand, private schools are these owned, managed & financed by the parents associations, business, non profit organizations or religious institutions & some times by the government. The basic understanding is that in most of the developing countries the performance of public schools is consistently below the performance of private schools. The main factors that differentiate these two types of schools are such as own the schools, how they are managed, which resources are available and how these resources are used, what are the students demographic and socio economic characteristics who attend such school, what is the school and community climate in these schools and so on.

Key Word: Education, Syllabus, Supply and Demand

I. INTRODUCTION

Kerala is ranked as one of the most literate state in India. There have been significant achievements in the field of social development and standard of life. Kerala has acquired a human development index when compared to the developed countries. In Kerala the priority is always given to education and schools are considered to be the nucleus of the social development. Good education arouses aspiration of the people and the main aim is always to improve the quality of the education provided.

II. OBJECTIVES OF THE STUDY

- ❖ To analyze the nature of physical and academic infrastructure various types of schools at thrissur district
- ❖ To examine the performances of different types of school at thrissur district

III. REVIEW OF LITERATURE

- **Harbindar Kaur (1999)** studied the different perceptions of parents of public and government primary schools with regard to problem of primary education and the difference on their children of different gender in the primary school. The researcher found as to what the levels of income and education of the parents affect on the perceptions about the primary education. It was found that parents respond differently on their perceptions to the problems in primary education on public and government schools, attitude of different genders with the difference on income and educational levels of the parents.
- **Ravinder Kumar (2008)** highlighted that the majority of schools were located in urban or semi urban areas and significant majority of schools were co-educational. The policies and plans for elementary education were devised, designed and developed at the national level only and these were implemented by the State. One of the observations was that the parents enrolled their wards in the school primarily to

feed them not to ensure better educational benefits for them through quality learning.

IV. COLLECTION OF DATA

The study was based on both primary and secondary data.

- ❖ The primary data collected on the supply side and demand side with the help of a predesigned questionnaire base. On the demand side, a sample of 80 respondents was selected from Thrissur district. To study the supply side a sample of 6 different Schools at high school students. Of the Six schools

selected- 2 private, 2 government, 2 aided etc. On the demand side, students and their parents were selected in proportion of the total student strength and so on... they were given separate schedules. Information was collected via schedule questionnaire from these schools for a period of 5 years etc.

- ❖ Secondary data: The study will be supported by secondary data which will be collected from 2017 Economic Review of Kerala state government and journals, books, articles, and research papers, and internet.

V. DATA ANALYSIS AND INTEPPRETATION

5.1 DEMAND SIDE ANALYSIS

Table 1: Syllabus preference – based on education qualification of parents

Board of Syllabus	Below SSLC	SSLC	Plus Two	Degree & Above	Total
SCERT	17	21	8	2	48
CBSE	3	3	4	6	16
ICSE	0	6	2	8	16
Total	20	30	14	16	80

Source: Primary Data

The above table shows the relationship between education qualification of parents and Board of syllabus selection. SCERT syllabus is preferred by below SSLC and SSLC qualified parents. But degree and above qualified parents prefer CBSE and ICSE syllabus. From this we can conclude that education qualification of parents effect children syllabus choice.

Table 2: Annual income of Family

Income	School			Total
	Public	Aided	Unaided	
Less than 50,000	14	14	0	28
50,000-2,00,000	2	16	10	28
Above 2,00,000	0	2	22	24

Source: Primary Data

Annual income of family is a good indicator to for the choice of school. Above 2 lakh income family prefer unaided school. The public and aided school student parent’s income is below 50,000. Children schooling is based on annual income of family.

Table 3: Rank various reasons for preferring a school

Factors	7	6	5	4	3	2	1	Total	Mean Rank	Rank
Travelling	22	2	10	6	6	6	28	80	10.64	5
Syllabus	30	20	12	12	4	0	2	80	16.14	2
Fees	0	0	10	10	16	14	30	80	7	7
Extracurricular activities	2	14	16	16	10	18	4	80	11.14	3
High result	22	32	16	6	4	0	0	80	16.5	1
Family Status	0	0	6	16	22	24	12	80	7.85	6
Infrastructure	4	12	10	14	18	18	4	80	10.71	4

Source: Primary Data

The above table show about the weighted average of each factor regarding the choice of preferring school based on different factors. This table shows a general ranking of the seven factors based on the respondents of the 80 respondents. From the respective result, High results is ranked first by the respondents followed by syllabus, extracurricular activities etc. 7th rank is given to fees.

5.2 SUPPLY SIDE ANALYSIS

Table 4: Facilities of School

Facilities	Smart class	Computer lab	Science lab	Purified drinking water	Sanitation	School bus	Total	Percentage
Public	5	60	2	4	45	0	116	26.60
Aided	10	40	2	6	55	7	120	27.52
Unaided	20	80	3	10	75	12	200	45.87

Source: Primary Data

Table shows that the various facilities of the schools. The result shows that comparatively unaided school have more facilities than public and aided school.

Table 5: Enrolment of Students

Type of school	2012-13	2013-14	2014-15	2015-16	2016-17	Total	Average
Govt	750	740	680	694	657	3521	704.2
Govt	320	328	248	100	56	1052	210.4
Aided	803	800	809	754	757	3923	784.6
Aided	680	685	720	830	848	3763	752.6
Private	850	890	920	1000	1050	4710	942
Private	750	798	899	1080	1125	4652	930.4

Source: Primary Data

In the case of public school, enrolment of students shows declining trend. The enrolment of students in private and aided school is increasing in recent years.

VI. FINDING OF STUDY

- ✓ Preference of syllabus based on education qualification of parents shows that SCERT syllabus is preferred by below SSLC and SSLC qualified parents. But degree and above qualified parents prefer CBSE and ICSE syllabus. From this we can conclude that education qualification of parents effect children syllabus choice.
- ✓ Annual income of family is a good indicator to for the choice of school. Above 2 lakh family income people prefer unaided school. The public and aided school student parent's income is below 50,000. Children schooling is based on annual income of family.
- ✓ The weighted average of each factors regarding the choice of preferring school of the 80 respondents shows that high results is ranked first by the respondents followed by syllabus, extracurricular activities etc.
- ✓ While taking facilities of the schools, the result shows that comparatively unaided school have more facilities than public and aided school.
- ✓ The result shows that in the case of public school, enrolment of students shows declining trend. The enrolment of students in private and aided school is increasing in recent years.

VII. SUGGESTIONS

1. Nowadays majority of parents prefer private and aided school than public school this is because of public school face difficulties such as lack of training, technology and skill. The public school should focus on creating its own strategies for development.
2. In public school, Management should act efficiently and effectively like private school.
3. Expansion of education institution should be promoted because it provides opportunity education for all.
4. Competition in education field is good because it provides opportunity to get wider knowledge. But government control is necessary for efficient working of the school.

IX.LIMITATIONS

The present study has a few limitations. The non availability of adequate information, lack of sufficient time and resources are some of the limitations of the study. The study is based on the data are collected through interviewing the officials in the schools.

The officials interviewed may have limited knowledge about certain aspects of the school administration and infrastructure. Therefore some inaccuracy may have crept into the data.

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AUTHOR:

HARITHA C.J M.A ECONOMICS, UGC-NET, KERALA, INDIA

Email Id: harithajayanvinayak@gmail.com

A 4-Year Retrospective Study on the Sero-Positivity of Typhoid among Patients Attending General Hospital Mubi.

Filgona Joel¹, Hamawa Stephen¹, Absolom Zena¹, Danis P. Wayagoron² and Tula, M.Y³

¹Department of Zoology, Adamawa State University, Mubi, Nigeria.

²Department of Medical Laboratory, General Hospital Mubi, Nigeria.

³Department of Biological Science Technology, Federal Polytechnic, Mubi, Adamawa State, Nigeria

Corresponding author: sadayaba@gmail.com +2348032938822

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ABSTRACT

Typhoid fever constitutes significant health problems in developing countries. This study examines the trend of typhoid fever retrospectively over a 4-year period among patients attending general hospital Mubi, Adamawa State. Medical records of clinically diagnosed patients with confirmed *Salmonella* infections were reviewed for the said period. Laboratory diagnosis for typhoid cases in this hospital was based on Widal agglutination tests. The test was performed with standardized *Salmonella enterica* serovar Typhi O and H antigens and values of titre equal or greater than 1:160 for O and H agglutinins were regarded as positive. The result showed an overall prevalence rate of 81.5% (2011-2012) and 82.3% (2013-2014). Highest cases of typhoid fever was reported among females (97.7%) than males (69.8%) in the year 2011-2012 and among males (84.8%) than females (79.0%) in the year 2013-2014 but with no statistical difference ($P=0.466$). The age group 30-60yrs are the most infected in both 2011-2012 (86.2%) and 2013-2014 (85.0%) but with no statistical difference with that of other age brackets ($P=0.118$). Statistically, the yearly distribution of typhoid fever showed no significant difference ($P=0.298$). However, monthly distribution of typhoid fever in the years under review showed significant variations. The number of positive cases recorded in all the years under study was significantly higher in August ($P=0.000$), but with no statistical difference with those recorded in June ($P=0.062$) and July ($P=0.078$). More so, November and December recorded significantly lower cases ($P=0.001$) than all other months.

Keywords: Salmonella, Typhoid fever, Retrospective, Mubi.

INTRODUCTION

Enteric fever popularly called typhoid or paratyphoid fever is a systemic infection caused primarily by *Salmonella enterica* subsp *enterica* serovars Typhi and Paratyphi A, B, or C. They are non-lactose fermenting, non-spore-forming Gram negative motile rods which ferment glucose with acid and gas production. Most species produce hydrogen sulphide (H_2S) but not urease. Major symptoms of the infections include persistent high fever with low pulse rate, severe headache, nausea, mental confusion, abdominal tenderness and pain. One of the commonest consequences of the infection is ileal perforation which even in childhood is associated with high morbidity and mortality (Ekenze *et al.*, 2008; Umeh and Agbulu, 2009).

In developing countries, typhoid fever is an important health problem where it is reported to claim 600,000 lives every year (Ambati *et al.*, 2007). It is endemic in Asia, Africa and Latin America where there are poor sanitation conditions. It is transmitted from person to person through food and water contaminated with faeces and urine from typhoid case or carrier (Ghosh *et al.*, 2010). Clean water, good sanitation, personal and domestic hygiene help to prevent the spread of typhoid and paratyphoid.

In Nigeria, typhoid fever is among the major widespread diseases affecting both young children and young adults as a result of many interrelated factors such as inadequate facilities for processing human wastes and indiscriminate use of antibiotics (Akinyemi *et al.*, 2012). Enteric fever is not only endemic in Nigeria, but constitute a great socio-medical problem because they are responsible for many cases of pyrexia, high morbidity and mortality (Rine *et al.*, 2013).

The epidemiological data on the distribution pattern of typhoid fever in Nigeria is uncertain but appears to show geographical variation. Although some studies reported the preponderance of the disease in male than female (Kam, 1996; Okome-Nkoumou *et al.*, 2000; Akinyemi *et al.*, 2005), another reported the preponderance of the disease in female than male (Afroz *et al.*, 2014). While one other study showed that age, sex and social class are not risk factors for enteric fever (Zailani *et al.*, 2004).

Treatment of *Salmonella* infection constitutes a major challenge to clinician because the organism is not only resistant to first line antibiotics, but also exhibits multi drug resistance phenotype against fluoroquinolones and third generation cephalosporins. This phenomenon may limit the possibilities for effective treatment of human infections (Afroz *et al.*, 2014). The high risk populations for *Salmonella* infections include young, elderly, pregnant woman, immune compromised and HIV infected individuals (Van der Klooster *et al.*, 1997; Doffinger *et al.*, 2005).

In Mubi metropolis of Adamawa State, Nigeria, inadequate water supplies is a serious socio-economic problem that has caused the inhabitants to resort to untreated well water and borehole water for domestic water supplies. These water sources are usually cited closely to septic tanks or refused dump sites which are responsible for water-borne infections such as enteric fevers (Tula *et al.*, 2013). Therefore, this study was undertaken to examine the trend of typhoid fever among patients that have attended Mubi General Hospital from 2011 to 2014.

MATERIALS AND METHODS

Study Area

Mubi comprises of the Mubi North and Mubi South Local Government Area of Adamawa State. It is situated in the North Eastern part of Nigeria, between latitude 10° 05' and 10° 30'N of the equator and between longitude 13° 12' and 13° 19'E of the Greenwich meridian. The climate is tropical with average climate of about 32-35°C in dry season and relative humidity ranging from 28-45%mm and an average rainfall of about 1056mm (Adebayo and Tukur, 1999), which usually start around May and last for almost 6 months, to October. The people of Mubi area are subsistence farmers, cattle rearers and livestock farmers. However, a few are civil servants and business men and women.

Mubi North and Mubi South has an international boundary with the Republic of Cameroon to the west, and surrounded by three Local Government Areas of Adamawa State; Maiha, Michika and Hong Local Government Area to the south, north and east respectively.

Study design

A 4-year retrospective cohort study on Typhoid fever was conducted in Mubi metropolis, Adamawa State, Nigeria, between 2011 and 2014. Mubi General Hospital was used as study area. The hospital serves as referral centres for both in-patients and out-patients in Mubi senatorial district which comprises of Madagali, Michika, Hong, Maiha, Mubi north and Mubi south local government areas. Medical records of clinically diagnosed patients with suspected cases *Salmonella* infections were reviewed for the 4-year period. Laboratory diagnosis for typhoid cases in this hospital was based on Widal agglutination tests. The test was performed with standardized *Salmonella enterica* serovar Typhi O and H antigens and values of titre equal or greater than 1:160 for O and H agglutinins were regarded as positive.

Statistical analysis

Non parametric Mann-Whitney statistics was used to compare the difference in age brackets, sex and distributions within the years under study. All statistical analyses were carried out using the SPSS 17.0 window based program. Significance difference was defined as $p \leq 0.05$.

RESULTS:

The result of this retrospective study showed an overall sero-positivity rate of 81.5% (2011-2012) and 82.3% (2013-2014). Based on sex, highest cases of typhoid fever was reported among females (97.7%) than males (69.8%) in the year 2011-12 and among males (84.8%) than females (79.0%) in the year 2013-2014, however, this difference is not significant ($P=0.466$) (Table 1).

The result in Table 2 showed prevalence rate based on age group. The age group 30-60yrs are the most susceptible to typhoid fever in both 2011-2012 (86.2%) and 2013-2014 (85.0%) but does not differ significantly with that of the other age groups ($P=0.118$). While the yearly distribution of typhoid fever does not show significant difference ($P=0.298$), monthly distribution of typhoid fever in the years under review showed significant variations. The number of positive cases recorded in all the years under study was significantly higher in august ($P=0.000$), but with no statistical difference with those recorded in June ($P=0.062$) and July ($P=0.078$). More so, November and December recorded significantly lower cases ($P=0.001$) than all other months (fig.1).

Table 1: Prevalence rate of typhoid fever in relation to sex among patients attending General Hospital Mubi from 2011-2014.

Sex	2011-2012			2013-2014		
	No. Tested	No. Positive	Prevalence (%)	No. Tested	No. Positive	Prevalence (%)
Male	5496	3838	69.8	4961	4206	84.8
Female	3952	3863	97.7	3802	3005	79.0
Total	9448	7701	81.5	8763	7211	82.3

Table 2: Prevalence rate of typhoid fever in relation to age group among patients attending General Hospital Mubi from 2011-2014.

Age group	2011-2012			2013-2014		
	No. Tested	No. Positive	Prevalence (%)	No. Tested	No. Positive	Prevalence (%)
<15	2764	2294	83.0	2176	1783	81.9
15-30	3048	2323	76.2	3088	2541	82.3
31-60	2361	2036	86.2	2208	1877	85.0
>60	1275	1048	82.2	1291	1010	78.2
Total	9448	7701	81.5	8763	7211	82.3

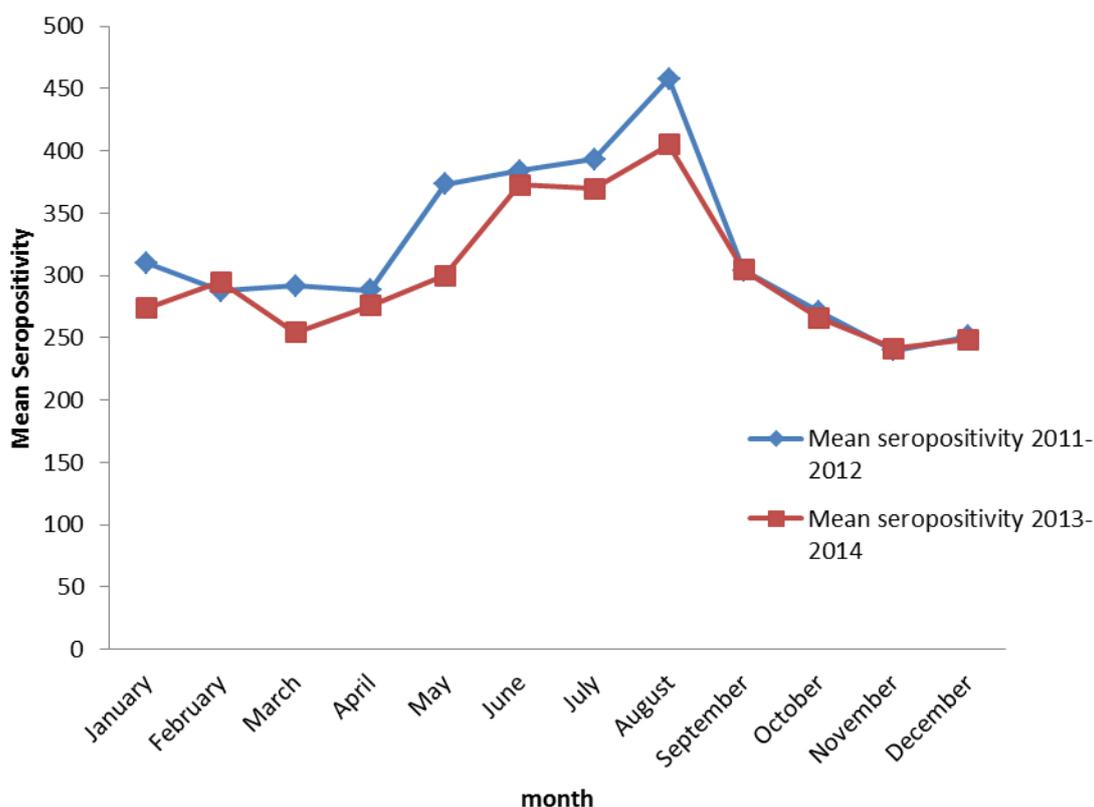


Fig. 1: Seasonal variation in seropositivity rates for 2011-2012 and 2013-2014.

DISCUSSION

Typhoid fever is a known cause of significant morbidity and mortality worldwide, especially in countries with growing population and poor sanitary conditions (Tuhina *et al.*, 2014). Result obtained from this study showed high rate of typhoid fever infection with significant seasonal variation that peak in August for the period under review.

The findings that males were more infected with typhoid bacilli as previously reported from Lagos (Akinyemi *et al.*, 2012; Ajayi *et al.*, 2015) collaborates with our findings for 2013-2014, but was contrary to our findings of 2011-2012. Also, our finding was similar to those observed in a study conducted in northern Nigeria where more males were implicated but the sex-related difference in infection rates did not vary significantly ($P < 0.05$) (Ameh and Opara, 2004). In line with our 2011-2012 result, a previous study reported that females had more typhoid and paratyphoid infections than males (Umeh and Agbulu, 2009; Afroz *et al.*, 2014). The authors inferred that the roles played girls child in performing most household chores such as fetching water from polluted streams could be the reason for such a result.

Findings in this study revealed that subjects within the age groups; <15 and 31-60 had the highest infection rate with typhoid fever, however the values do not significantly differ with rate obtained for other age groups. This finding corroborated the report of similar study carried out by Rine *et al.* (2014) and Afroz *et al.* (2014).

A report from north-central Nigeria had implicated young adults within the 11 to 20 years and 21 to 30 years age groups to be the most vulnerable members of the community (Ameh and Opara, 2004). In other parts of the world, typhoid fever, has been known to be a disease of the school-aged children and young adults and milder in infants (CDC, 2005).

Report from a previous study also showed that the most vulnerable age group is between 10-14yrs. This could be attributed to less restrictive nurturing, increased in consumption of unhygienic food and water, bathing and swimming in ponds, etc (Ghosh *et al.*, 2010; Saha *et al.*, 2003). Similarly, in India, the age group at highest risk of infection by typhoid fever has been established to be between 2-3 years of age (Saha *et al.*, 2003; Sur *et al.*, 2009).

Lack of statistical difference in relation to age group as shown in our study indicates that typhoid fever is not correlated with age difference. This observation was buttressed by previous reports which indicated that typhoidal antibodies were not correlated with age and sex; implying that both sexes and age groups are equally predisposed to enteric fevers (Zailani *et al.*, 2004; Umeh and Agbulu, 2009).

The monthly distribution of typhoid fever showed a significant variation with the peak in August, followed by July and June. This finding was similar to previous report which showed a higher prevalence from July to October each year (Afroz *et al.*, 2014). Another previous study revealed that typhoidal antibodies in most age groups occurred more in wet season than in the dry season, and supports the fact that microbial contamination of foods and water are more likely in the warmer seasons when bacterial pathogens multiply very rapidly (Ebele *et al.*, 2010).

Salmonella infection remains a major public health concern worldwide, contributing to the economic burden of both industrialized and underdeveloped countries through the costs associated with surveillance, prevention and treatment of disease (Shu-kee *et al.*, 2015; Crump *et al.* 2004). Complications caused by typhoid fever such as typhoid psychosis, septicemia, intestinal perforations, hepatosplenomegaly and haemorrhage have been documented to increase mortality in areas characterized by inadequate sanitation, poor hygienic practices and drug abuse (Akinyemi *et al.*, 2012).

Moreover, the emergence of MDR *Salmonella* strains poses a great challenge in terms of effective treatment of the infections caused by these strains. Several preventive measures have been proposed to stop the spread of *Salmonella* infection, and the restriction of indiscriminate use of antibiotics in food animals is by far one of the most effective measures (Shu-kee *et al.*, 2015).

While bacteriological culture remains the gold standard for definitive diagnosis of typhoid fever, lack of its immediate availability during the acute febrile illness, particularly in areas where culture facilities are either poor or not available, may limit its use.

CONCLUSION

The ultimate goal for the eradication of typhoid fever is to put in place adequate and concrete preventive measures either by individuals, communities or government. The hallmark of any preventive intervention may include provision of portable drinking water, proper sewage disposal system and improved personal and community hygiene. However, when the disease ensues, mortality could be reduced with early diagnosis, prompt resuscitation, use of potent antibiotics, and emergency operative treatment when perforation and peritonitis occurred unexpectedly.

Limitation of the study

Only typhoid febrile agglutination test (Widal test) was used to assess the prevalence of typhoid fever in the study area. Various reports showed that this test is often positive in patients with infections caused by other bacteria, because of cross-reacting antibodies or previous immunization (vaccination) against typhoid.

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Ozone Depleting Substances (ODS) Alternatives Survey in Myanmar

Kyi Kyi Pyone *

Department of Mechanical Engineering, West Yangon Technological University

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Abstract- : In these days, what we used to know as freak weather is no longer freak after all, but something to be expected, something that occurs, if not with seasonal regularity but with frequencies of alarming quantities. Therefore, weather abnormalities form a clear and present danger and so well all have to chip in to give momentum to that noble and grand effort to establish a green infrastructure on this planet. The essence of putting to place a green infrastructure is to reduce energy consumption, a necessary evil in the present day civilized and progressive society. Energy usage by Air Conditioning and Mechanical Ventilation (ACMV) in buildings being the major portion, its reduction is to be achieved by all means Myanmar architects will have to foster a mindset that building services form as much an integral part of a building as the aesthetic qualities of the façade Special attention is to be paid in designing the southern facades, such as weaving in structurally integrated sunshades building materials with very low thermal conductivity, air passages to let the outside wind flow in and take away some heat away from the walls. To utilize passive or semi passive ways, in other words, to use natural ways to combat high temperatures inside the building, should form the foremost considerations on the part of the architect. In Myanmar, in some places, the land for a buildings site is not so limited as in developed countries, thus the use of thermal storage, involving large footprints is to be encouraged and so reducing the size of motor and other associated electrical costs. Last but not least, is the great scourge of the green planet the CFC refrigerant. Myanmar like other countries is doing its best to phase out R 22 and introduce ozone friendly refrigerants. But the changeover is yet to become a smooth one. The necessary steps have been taken on a national level but many bugs need to be ironed out such as the distribution of refrigerants. ACMV industry has long way to go to become a truly green technology but all the persons involved are fully aware of the need to take that road and it can be said with confidence that more than one step has been taken in the right direction.

Index Terms- Environment friendly Refrigerant, CFC Refrigerant, R 22, R410A, R134a

I. INTRODUCTION

environment and conservation are accorded high priority in the Government's efforts for sustainable development in benefit social and economic development of its people. It has been clearly stated that one of the basic principles under the National Development Plan for 2006-10 is to ensure sustainable management of nation's environment and natural resources.

While Myanmar confirms its commitment to the Montreal Protocol, the HCFC phase out action plan will need to harmonize with the national development policies and result in minimum economic loss to the country Myanmar has considered various possible scenarios 'technology driver,' 'delayed action ' and 'recommended'. This accelerated phase-down schedule will phase-out HCFC with more aggressive reduction targets than those agreed the Parties to the Montreal Protocol at its 19th Meeting in September 2007. The aim of the certification of refrigeration technicians is to improve the serving practice of the industry and thereby reduce the use of HCFCs to service RAC equipment. Myanmar will require that the technicians are certified before they are allowed to handle/ service RAC equipment. The Ministry of Environment, in close consultation with the Ministry of Labor and Vocational Training and Refrigeration Association will be responsible for establishment of certification of refrigeration technicians in consultation with NOU.

II. STRATEGY AND PLAN FOR IMPLEMENTATION OF (HCFC) PHASE OUT

Under the recommended plan, Myanmar will be following a three-pronged approach for the HCFC phase-out comprising the following elements:

1. Limit the supply of HCFCs.
2. Reduce the demand of HCFCs for servicing existing equipment.
3. Limit new demand for HCFCs.

This three-pronged approach aims to reduce the dependence on HCFCs according to the above phase-out schedule. The implementation plan includes measures which are a combination of (a) regulations and economic instruments, (b) training and capacity building, (c) awareness and information outreach, and (d) project initiatives. Given that the phase-out of HCFCs concerns not only the industry and adjustment and preparation must be allocated for these main groups.

Interventions under Strategic Elements A and B described in this document will be implemented during 2011-5 while most of the elements under Strategic Element C will be implemented during 2015-20.

Strategic Element A: Limit the supply of HCFC

To limit the supply of HCFC, Myanmar proposes to implement the following activities.

Restrict import of other HCFCs except HCFC – 22 and HCFC – 123

Myanmar only uses HCFC-22. To send strong signal to the industry on Government's HCFC phase-out policy. Myanmar NOU will restrict the import of other HCFCs that have not previously been used in Myanmar.

III. TRAINING OF ENFORCEMENT OFFICERS

In order to enforce the import quota on HCFC and HCFC-based equipment and to prevent unintended exports, the capacity of enforcement officers from General Department of Customs and Excise and Cam Control will need to be strengthened. While the enforcement officers have already received training during the implementation of RMP/ TPMP, there will be significant changes on the licensing system procedure and additional requirement for supporting documents. Cam Control officers are also expected to inspect and enforce labeling requirement for HCFC container including blends and HCFC-based RAC equipment in the domestic market.

The focus of previous trainings was on CFC and CFC-based equipment such as MAC and refrigerators. The proposed training for this will focus on the revised licensing system procedures and on inspecting HCFCs and HCFC-based equipment such as AC and also will serve as a refresher course for existing officers and as in initial training for new officers on Montreal Protocol, Harmonized System (HS) codes and customs procedure.

Labeling of HCFC container

Myanmar will strengthen the enforcement of its existing labeling requirement to ensure that each importer puts a sticker on all imported HCFC containers before they are released to the market. The NOU will carry out regular checks with the retailers to inspect whether the HCFC container carry Ministry of Environment sticker or not.

Controlling sales of HCFC

Myanmar plans to restrict the sales of HCFCs only to registered workshops or certified technicians. Under this proposal, the importer/ distributor can only sell HCFCs to servicing workshops that have registered with the Department of Industry, MIME or to a certified refrigeration technician. This measure would allow Myanmar to limit sales of HCFC and to monitor HCFC uses. The importer/ distributor will be required to keep a log book on the amount of refrigerant that are sold to servicing workshop and certified technicians and to report the NOU on an annual basis. Their cooperation with this requirement will be taken into consideration during the granting of HCFC import permits in the following year.

Introduction of economic disincentive on HCFC import

The labeling of HCFC container as described above will serve as a deterrent from smuggling of illegally imported HCFCs.

Strategic Element B: Reduce demand of HCFCs for servicing existing Equipment The training would also cover basic information on later native refrigerants to HCFC such R-407C, R-410A, ammonia and propane.

However, given that there are a number of zero-ODP and low-GWP refrigerants under research and development, it is

envisioned that there would be a need for additional training on alternative refrigerants once the technology are matured, widely adopted and available in the region.

Further, it is expected that the private sector (i.e., companies and installing air conditioning equipment) would play a participatory role in training and other project implementation activities given their established geographic sales and service network.

Investment component to support good servicing practice

A recovery and reuse initiative will be introduced in Stage 1 to prevent avoidable emissions during servicing maintenance practice and consequently will help in reduction of demand of virgin HCFCs. This will involve supply of equipment and accessories to recover and reuse HCFC refrigerant during servicing and maintenance operators.

Retrofit incentive project for end-users

A retrofit project to replace HCFC-based equipment with ODS-free climate friendly alternatives would be undertaken in two phases: 1) initiation phase, and 2) final phase. The main purpose of the initiation phase is to demonstrate retrofit options and disseminate performance information on HCFC free climate friendly alternatives under local conditions. This project will integrate with the recovery and reuse program so that, besides adoption of climate friendly ODS-free alternatives, reduction on dependence on HCFC-based equipment is demonstrated.

IV. SURVEY METHODOLOGY AND APPROACH

This Survey was undertaken by Myanmar Engineering Society, MES in collaboration with Environmental Conservation Department (ECD) of Ministry of Natural Resource and Environmental Conservation with the assistance of the UN Environment acting as the implementation agency. The Scope of ODS alternative surveys included current consumption of ODS alternatives, estimate growth patterns of ODS alternatives by substances and identify challenges and opportunities for the transition to low-GWP alternatives for various application.

Before conducting ODS alternatives survey, the working committee is formed with the representatives from all stakeholders of both government departments & private sectors for the preparation of surveys by briefing & understanding the purpose of surveys and to be as accurate as possible. The parties involve are Ministry of Commerce and Trade, Custom Department, Ministry of Industry, Department of Research and Innovation, Environmental Conservation Department, Ministry of Natural Resource and Environmental Conservation, Ministry of Transport and Myanmar Engineering Society and other private sectors of Importers & Distributors of chemicals (ODS & ODS alternatives), Refrigeration & Air-conditioning equipment and their respective service companies and end-users.

The data collection was carried out with five task force groups whilst MES project office collected data from various government departments. The collected data include all the official ODS alternatives and equipment imported quantity from ECD, Myanmar Custom, Ministry of Trade, Ministry of Industry, Ministry of Transport as well as data from importers, distributors and end-users. Myanmar as a reactive market, all of the HCFC and HFC refrigerants and Ammonia are imported through importers, investors and project developers with their own projects in various sectors for their applications. But, Ammonia and carbon dioxide gas can be available from some local industries with limited amount.

The consumption of alternatives to ODS are also forecasted to experience a rapid growth and this survey presents a better understanding on ODS alternatives development trends, and all stakeholders need to take appropriate measures for introducing of low GWP ODS alternatives, which including training of technician on the safe use of other ODS alternatives as well with sense of responsibilities; regulating the operation of ODS alternatives related businesses and eventually to develop and enforce the national standards or codes to guide the servicing practices; outreaching to the end-users and the public concerning low GWP ODS alternatives with higher energy efficiency products, etc.

V. ODS ALTERNATIVES SURVEY DATA

This section described the data gathered on the use of ODS alternatives and analysis of the data collected in Myanmar. The distribution and supply chain, the sectors and sub-sectors where ODS alternatives are used, and production of ODS alternatives where applicable were also discussed.

A) Statistics of ODS alternatives import, export and production (Top-down Approach)

From desk study and data survey, there is no ODS alternatives production or export in Myanmar. The refrigerants are predominantly imported from other countries i.e China and Singapore. At the moment, the import of ODS alternatives is controlled by the Ministry of Commerce. The importers of any ODS alternatives need to have the license issued by the Ministry of Commerce to show to the Customs officer during the clearance process.

However, although the license for import ODS alternatives is required by the Ministry of Commerce, due to limited time to conduct the survey, the data from both Ministry of Commerce and the Customs Department are not available to MES for further analysis.

In this regard, the data collected from the bottom-up approach would be used to analysis the use of ODS alternatives in Myanmar.

B) Other Regulations

Regarding present control of & standards, Prevention of Hazard from Chemical and Related Substances Law was introduced by Ministry of Industry in August 2013 and the same with version of Rules was introduced in 2016. However, they are still very general and more specific standard or code is required for storage, handling, transportation, application & usage etc. for ODS alternatives and especially for substances with higher flammability like HFC-32, HC-290 etc.

C) ODS alternatives usage by sector in Myanmar

The survey data are presented following the guideline provided by the Compliance Assistance Programme of UN Environment. The details data are shown in the attached table. The observations following the data analysis and best forecast of ODS alternatives growth trends is presented below:

Room Air Conditioning units: For room air conditioning units, HCFC-22 is commonly used and R-410A is started to use in a small quantity since 2012 and the trend is increasing. This market transformation to R-410A technology is attributed to the government strategies to phase-out HCFC-22 under the HCFC Phase-out Management Plan and ECD's plan to ban the import of HCFC room air-conditioning with less than 2.5 HP from 2018 onward and will totally ban the import of all types of HCFC-based equipment in 2021. The import of R-410A is forecasted to increase in the coming years. HFC-32 is expected to import in smaller scale started from 2017 whereas R-290 may be introduced in 2019 with small market share (this also depends on the market availability of R-290 room air-conditioner). However, fire safety is the main concern for new refrigerants and proper training & capacity building of all related parties are needed urgently.

The equipment inventory for 2012 is developed based on the collected data and also referring to the country economic factors such as foreign direct investment (FDI) projects, Naypyitaw city development etc. For R-410A, it was only started imported into Myanmar in 2011 and therefore the quantity is much less than R22. The rest of the year 2013 to 2016 data are based from collected survey. The average growth rate based on the past 4 years in However, it was adjusted to 18% to reflect more realistic growth.

Chiller units: Chillers are currently installed in commercial & industrial projects and HFC-134a is commonly used when compared to R-410a. Growth rate of chillers are expected to increase significantly in the years to come due to the anticipated economic development and foreign investment into Myanmar. It is anticipated that alternatives to HCFCs in the chiller sector will still be HFC-134a and R-410A until 2030.

As per the 4 years (from 2013 to 2016) data, that growth rate of new equipment imported in the year 2015 & 2016 is quite substantial compared to the previous years (*although the absolute number is not so high as the numbers of initial installed*

equipment are rather small). As a result, the 4 years' average growth rate is about 49%. Despite the fact that Myanmar GDP growth is about 7%, potential market demand and growth on hospitalities & commercial business are expected to be increased especially FDI investments for the years to come, therefore, the growth rate is adjusted to 12% in lieu of 49% or 7%. In the past R-22 is mainly used, but for the new installation, both R-134a and R-410a based are growing steadily, and they are slowly replacing R-22, which will be phased out in future.

Commercial Refrigerator: Commercial refrigerators currently use both HFC-134a as well as R-404A as alternatives to HCFCs for both stand-alone and condensing units. It is anticipated that there will be significant growth in the commercial refrigeration sector. HFC-134a and R-404A will be still the main refrigerants in this sector during the forecasted period.

Four years average growth rate of 23% is observed for commercial refrigerators. It is expected the similar path of growth in the future would be maintained and therefore, 23% is used without adjustment. For the usage of standalone and condensing units, the frequency of servicing is slightly higher due to the quality issue of equipment used in Myanmar. In the past R-22 is mainly used and new installation are basically using HFC-134a and R-404A with similar share. The total import are anticipated to in the year 2030 for R134a and R404A respectively and they will slowly replace all R-22 based installation.

Mobile air conditioning equipment: mobile air-conditioning sector uses only HFC-134a. In the past, there was significant growth in the import of vehicle that increased the number of vehicle. This has had the direct impact to the use of HFC-134a. HFO-134yf are unlikely to replace HFC-134a in the near future, but might be introduced into the country in the next 4-5 years.

Inventory is developed based on the collected data from Ministry of Transport. Motor car import licenses are only issued started in 2013 and sudden surge of imported vehicles is observed (it was previously not allowed). Due to the shortage of public transport system in Yangon, 3,000 big buses were imported in 2013. Therefore, the growth rate is rather random. For future forecast, the growth rate need to be carefully adjusted with reference to country future economic policy. For the usage, the numbers of vehicle import became limited recently again. Hence, overall figures for small vehicles could be less in near future especially second-hand vehicle which import is limited nowadays by year of production due to new regulations. In contrary, due to government concession tax rate given to vehicle manufacturers to invest in Myanmar, more vehicles will be produced locally with affordable price in future and the usage rate may eventually still possible to be on high side (Nissan, Suzuki & Ford factories are already started their projects). Regarding the usage for big buses, the practice is the similar to the other countries due to many reasons. Instead of topping-up, refrigerants are totally flush-out at

first and recharge all new gases when arrived Myanmar. Therefore, the top-up quantity is likely to be on high side. Furthermore, market demand for most of buses in future are with air-conditioning units. HFC-134a is mainly used for all vehicles and HFO-1234yf is expected to be used in future for small vehicle. vehicles reaching 20% in year 2030. The average Growth Rate of the Import Statistics is 5% for small vehicle, 15% for buses and 15% for large vehicles respectively. Growth rate for small car after year 2020 is expected to be 10% when local assembly factories are completed, and vehicles are available in the market.

Domestic Refrigerator: Domestic refrigerators and freezer use both HFC-134a and HC-600a where HFC-134a based has higher market share. Nevertheless, the overall amount of gas use is quite small compared to other categories due to its limited charging amount requirements and the less frequency for servicing requirement. In the next 15 years, it is anticipated that HFC-134a will be dominated in this subsector with increasing share of R-600a.

The collection of data on numbers of domestic refrigerator inventory in 2012 is almost impossible as they are used in the country for many decades as common household items. The reference data is taken from national electrification plan. Presently, 2.3 million households have electrical connection, less than 30% of total population and Yangon alone has slightly more than 10% of total population. It is estimated at least between 5 to 10% of total households with electricity connection own refrigerators and the inventory for year 2012 is estimated with possible figure of 5% of today households with electrical connection (*The total population in 2012 is 51 million compared with present 53 million*). From 2012 onwards, import of domestic refrigerators data are taken from the present survey and the growth rate is observed as 28%. HFC-134a is mainly used in the past where R-600a started to import in 2014 in small quantity and reaching to 36% of total market by year 2030.

Cold Storage: Large refrigeration system e.g. cold storage is dominated by R-404A and ammonia technology respectively. The growth rate is expected to be high as a result of change of life style in 21st century, economic development and foreign investment into Myanmar.

Inventory is based on collected data and the growth is calculated from 4 years average from 2013 to 2016. Growth fluctuation is rather high due to its nature of prolong project period taking into consideration of planning, obtaining Myanmar Investment Commission approval and project implementation and most of construction projects overlap to the year after. Cold storage industries are expected to grow strongly catching up with changing life style of 21st century. Although the growth rate of four years average is observed as 22%, more feasible growth rate of 15% is taken presently. It might be lowered than the sharp increase of market demand in long run.

Environmental Characteristics

Traditionally ammonia plants are installed in the past but R-404a plants are catching up and today both installed plants are nearly the same. However, R-404a plants are becoming more preferred and overtaking ammonia plants in the near future due to its safer operation without severe occupational hazards like ammonia.

VI. CONCLUSION

1. Without continuous efforts by MES members & all the stakeholders, it would be difficult to conduct the survey and obtain required information. The close collaboration and cooperation among concerned stakeholders are the key to the success in the implementation.

2. As per the data collected/analyzed based Bottom-up approach, the dominant ODS alternative is high GWP HFC in various sectors, while the low GWP alternatives such as ammonia are also used in Myanmar, the safety-related issues have not yet been properly addressed. The survey revealed that Myanmar is facing a challenge in

- a. Controlling the growth of stock of HFC-based equipment, which is anticipated from the economic development and the foreign investment trend. There must be a strategy to control the growth of high GWP HFC and to promote lower GWP alternatives.
- b. There is no reliable mechanism in obtaining the import statistics of ODS alternatives. It is critical to establish an effective mechanism to track and monitor the import of these HFCs which is controlled under the Kigali Amendment.

3. For introducing low GWP alternatives, it is important to educate the public; all stakeholders need to take appropriate measures for introducing low GWP alternatives, including training of technicians on the safe use of ODS alternatives with a sense of responsibility; regulating the operation of ODS alternatives related businesses and eventually to develop and enforce the national standards or codes to guide the servicing practices; outreaching to the end-users and the public awareness rising concerning low GWP ODS alternatives with higher energy efficiency products, etc.

4. Provide training with case studies of similar UNEP projects is very useful for the survey and analysis. With sufficient time and

the co-operation of stakeholders, the data collection was much easier with improved results.

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AUTHOR

First Author – Kyi Kyi Pyone, Lecturer, Department of Mechanical Engineering, West Yangon Technological University and kkp.mech@gmail.com.

Cooperative Learning in the Learning Activity of Students

Rendika Vhalery*, Nofriansyah**

Universitas Negeri Padang**

* rendikavhalery31@gmail.com / rendikavhalery@student.unp.ac.id
** nofriansyah10@gmail.com / nofriansyah@student.unp.ac.id

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Abstract- This study is aimed at comparing team-assisted individualization learning model and scramble learning model toward student's learning activities on social science subject, SMP Negeri 19 Palembang. This is a comparative study using a completely randomized design. The population of this study was all eighth grade classes consisting of 354 students. Cluster random sampling was used to decide the sample of this study in which class VIII.10 as experiment-1 and VIII.9 as experiment-2; Each class consists of 35 students. The technique of data collection used in this study was observation. SPSS 24.0 was used to analyze the data. The result shows that there are active learning activities. Statistically, scramble learning model is more interesting than team-assisted individualization learning model.

Keyword : *team-assisted individualization; scramble; activities*

I. INTRODUCTION

Talking about education means talking about the nation's generation. The education system in Indonesia is governed by the Law of the Republic of Indonesia number 20 of 2003. Activities in the field are closely related to Permendikbud number 22 of 2016 about the standard of educational process that contains the learning process planning, implementation of learning process, assessment of learning outcomes, and supervision of the learning process. The main focus of the process standard is the planning of learning process including syllabus and learning implementation plan (RPP) (Kemdikbud, 2016). Syllabus is the basic framework for the development of lesson plans. The learning implementation plan is prepared for the learning process activities.

The components of the learning implementation plan consist of the school's identity which is the name of the education unit, the subject's identity or theme / sub-theme, class / semester, main subject, time allocation, learning objectives formulated based on basic competencies, basic competencies and indicators of competency achievement, learning materials, learning methods, learning media, learning resources, learning steps, and assessment of learning outcomes (Kemdikbud, 2016). Ideally, the points of learning method are often ignored by some teachers. Teachers often use traditional methods such as lectures that become learning centers and students just listen, take notes, and do sums (Kurniawan & Suripno, 2016). As a result students become not interested in following the learning process and more often do other activities that are less useful when they should be studying. Teachers should understand that effective learning is a learner-centered learning that enhances achievement, motivation, cognition, activity, and social life of the students (Zakaria, Solfitri, Daud, & Abidin, 2013; Johnson & Johnson, 2014).

Learning activities are activities undertaken by students when participating in the activities of learning in the classroom. The activities of students in the learning process can be categorized as determinant factors. If students do not have learning activities then students are not motivated to learn and the attention of students on the learning process will be reduced and become passive students. However, students who have good learning activities will participate in the learning process so that students can develop the talents, abilities, and skills possessed. Simply put, active students will understand and know the materials given more optimally than the passive students. Learning activities correlates with the physical and mental state of the students. Therefore, learning activities need to be presented in the learning process through one of the learning methods and the cooperative learning model is perfect for this problem (Gupta & Pasrija, 2016).

Slavin (1984; 2014) revealed that cooperative learning models connect teachers with students to create an effective learning process. The reward system existing in the cooperative learning model makes the learner enthusiastic (Slavin, 2014). The cooperative learning structures form students into small groups or large groups to work together while the teacher works as a facilitator (Davidson, Major, & Michaelsen, 2014). Cooperation among students increases their trust, psychological, cognitive, and social networks aspects (Angela MO'Donnell, 2006). The cooperative learning model consists of several types, including Student Teams Achievement Devision, Team Game Tournament, Learning Together, Team Assisted Individualization, Make A Match, Jigsaw, Talking Stick, Co-op Co-op, Group Investigation and Sramble (Gambari & Yusuf, 2014; Gupta & Pasrija, 2016; Ma'ruf, 2018). This study focuses on cooperative learning model of team assisted individualization and scramble type.

According to Pramestasari & Qohar (2016) the learning model of Team Assisted Individualization is a cooperative learning model that combines the concept of individual learning and group learning in cooperative groups (small or large). Team Assisted Individualization learning model can also help create an effective learning atmosphere and can solve the academic problems of students (Tinungki, 2015). Behavioral, cognitive, and social formation can also occur during the learning process (Tilaar, 2014). The learning model of team assisted individualization can stimulate students to develop their intellectual ability to become more active (Zakaria et al., 2013). In the implementation of the learning model team assisted individualization students learn in a group consisting of 4-5 people (Huda, 2013). If one member of the group has difficulty in learning, then a group of friends will be an assistant to help him overcome his learning difficulties (Lau, Kwong, Chong, & Wong, 2013). Teachers are only limited to guide, direct, and become a reference to ask, because this model is centered on students (student centered) so as to increase learning activities of students in the learning process. Romiyati, Akhdinirwanto, & Ngazizah (2012) proved that the use of team teaching model assisted individualization can improve students' learning activities. On the other hand, Hasmyati (2017) explained that the learning model of team assisted individualization is less efficient than other cooperative learning models. Therefore, this study tries to clarify the difference of the argument.

Another cooperative learning model is the Scramble learning model. The scramble learning model helps the learning process in the classroom become active because it involves all students. The scramble learning model is used to improve and develop the students' mindset because it requires students to use and combine right-brain and left-brain performance in the learning process (Huda, 2013). In the implementation, it begins with the teacher presenting the material according to the topic studied. Teachers create study groups and share prepared worksheets for each group. Group members compile and match the questions and answers to get the right answer (Ma'ruf, 2018). In the learning activities of students, the use of this learning model is very effective and efficient because this learning model helps students understand the subject, encouraging students to think quickly, accurately and ready to answer questions from the teachers. Sugiarta (2012) proved that the learning model of Scramble can improve the activity and learning outcomes of students.

The use of cooperative learning model of team assisted individualization and scramble type is understood by the teacher as a theory only. It is feared that lack of knowledge and practice will become a problem one day. In addition, this learning model has not given direct contribution. Therefore, the study is expected to contribute and become a reference to avoid and minimize the impact. The study will conduct experiments using the team assisted individualization learning model and the scramble learning model in the experimental class. In particular, this study aims to find out the answers to the following questions.

- 1) To which extent is the influence of the learning model of team assisted individualization on the learning activities of students ?
- 2) To which extent is the influence of learning model scramble on the learning activities of students ?
- 3) The comparison of learning models of team assisted individualization and model learning sramble ?

The next discussion consists of several parts. Part 2 is a method that discusses the procedure of data collection and data analysis. Section 3 presents the results of research and discussion briefly. Section 4 conclusions from this study.

II. METHOD

The population of this study is class VIII students consisting of ten classes with 354 people. Cluster Random Sampling sampling technique was performed to determine experiment class 1 and experiment class 2. Steps in sample taking for experiment 1 and experiment 2 is as follows. First, preparing the class data to be sampled for the experimental class 1 and the experimental class 2. Second, writing each class on a piece of paper then rolled and put into two boxes (one box containing five rolls of paper) then drawn. After that, Taking one roll of paper from each box to determine the sample. Thirdly, after the draw was obtained two classes, namely class VIII.10 as experimental class 1 and class VIII.9 as experiment class 2.

This type of study is comparative using Completely Randomized Design. Using pre and post observations. Using two experimental classes of experimental class 1 and experiment class 2. The learning in the experimental class 1 uses the Team Assisted

Individualization learning model and the learning in the experimental class 2 using the Scramble learning model. This activity was conducted 5 times with the details such as; the 1st meeting of pre-observation before being treated by the learning model, the 2nd meeting until the 4th meeting is treated by Team Assisted Individualization and the 5th post-observation after being treated by the model of learning. Meanwhile, class VIII.9 was treated with Scramble learning model. This activity was conducted 5 times meeting with details such as; the 1st meeting of pre-observation before being treated by the learning model, the second meeting until the 4th meeting was given the Scramble study and the fifth post-observation post after being treated by the learning model.

1.1 Steps of using the learning model in the experimental class

1.1.1 Preparation Phase

- 1) Selecting two experimental classes: experimental class 1 and experiment class 2 for the use of learning model.
- 2) Creating a learning plan and preparing learning resources to implement the learning process.
- 3) Using the Team Assisted Individualization learning model in the experiment class 1 and using the experimental classroom Scramble in experiment class 2.
- 4) Develop assessment instruments (observation).
- 5) Test the validity of assessment instruments.

1.1.2 Implementation Phase

- 1) Conducting the learning process by applying the Team Assisted Individualization learning model and the Scramble learning model.
- 2) Providing learning materials about the demand to students using charta media.
- 3) Form a small group consisting of 5 members.
- 4) Assessment of observation at each meeting about the application of the model and see the learning activities of students in learning.

1.1.3 Completion Phase

- 1) Analyze the students' learning activities data from the observation.
- 2) Analyze data on the implementation of the Teaching Assisted Individualization model and the Scramble learning model.
- 3) Analyze the observed data that has been collected to see the effect of the Team Assisted Individualization learning model and the Scramble learning model.
- 4) Hypothesis testing.
- 5) Conclusion of the use of learning model.

III. RESULTS AND DISCUSSION

This study aims to find out the extent to which the influence of learning model team assisted individualization and learning model of learning scramble. Then the comparison of team assisted individualization model is being compared with the scramble learning model. The Comparison of learning model of team assisted individualization and scramble will be using t-test. Learning model experimental results are described as follows.

1.2 The Influence of Learning Model of Team Assisted Individualization on students activity of students

1.2.1 The Use of Team Assisted Individualization Learning Model

Regression analysis statistic test was used to see the effect of cooperative learning model of type assisted individualization team to the learning activities of students on IPS subjects. The regression estimation model used is $Y = a + bx$ to see the decrease or increase of learning activity. Results of data processing regression with the help of SPSS 24.0 program can be seen in table 1 and table 2 as follows.

Table 1. The use of the team assisted individualization learning model

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3667,009	1	3667,009	287,181	,000
	Residual	421,376	33	12,769		
	Total	4088,386	34			
	R			,947		
	R Square			,897		
	Adjusted R Square			,894		
	Std. Error of the Estimate			3,573		

The result of using the assisted individualization team learning model (table 1) shows that the F value is 287,181 with the sig level. $0.000 < 0,05$ which means the learning model of team assisted individualization influences the learning activity of the students significantly. R square = 0,897 means the contribution of learning model of assisted individualization team to learning activity equals to 89,7%, whereas 10,3% is determined by factor other. The result of regression coefficient of team learning model assisted individualization can be seen in table 2 below.

Table 2. Coefficient of learning model of TAI in learning activities of students

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1	(Constant)	-122,405	10,436	-11,729	,000
	Learning activity	1,906	,112	,947	,000

Based on the regression estimation model used, $Y = -122,405 + 1,906 X$. The constant value of -122,405 shows that without the use of team assisted individualization learning model, student learning activity is below average. The value of t arithmetic 16.946 and sig level. $0.000 < 0,05$, meaning each use 1 unit of learning model assisted individualization team will increase 1,906 per student activity unit.

1.2.2 Description of learning activities of students

The experimental activity in the implementation of the Team Assisted Individualization learning model shows the result of the improvement of students' learning activities on the social studies subjects. Increased activity is seen through observations made at the time before and after the applied model of learning Team Assisted Individualization. The results of learning activities are interpreted into several criteria that can be seen in table 3 below.

Table 3. Rating criteria before and after use of TAI learning model

Score	Criteria	Before		After	
		Student	%	Student	%
86 - 100	Very Active	0	0%	32	91,4%
71 - 85	Active	2	5.7%	3	8,6%
56 - 70	Enough	17	48.6%	0	0%
41 - 55	Less Active	11	31.4%	0	0%
0 - 40	Very Less Active	5	14.3%	0	0%
	Total	35	100%	35	100%
	Smallest score	35		83	
	Highest score	74	54,5%	100	91,5%
	Interpretation	Less Active		Very Active	

Based on table 3 it could be seen the differences in learning activities of students in the learning process before and after being treated by the model learning Team Assisted Individualization. Prior to the use of the learning model of Tested Assisted Individualization, the smallest score in experiment 1 was 35 and the highest score was 74 with an average grade of 54.5% in the less active category. That is, the level of learning activities of students prior to the use of learning model Team Assisted Individualization is less active which causes students to be passive and lazy to learn. Individually known as many as 5 (14,3%) students are in very less active category, 11 (31,4%) students are in less active category, 17 (48,6%) students are in active enough category, and only 2 (5.7%) of the students are in the active category. That is, most of the students in experiment 1 class have enough learning activity that leads to less active.

After the implementation of the team learning assisted individualization team, it was found that the smallest value in experimental class 1 was 83 and the highest score was 100 with an average of 91.5% in the very active category. Individually known as many as 3 (8.6%) of students who are in the active category and as many as 32 (91.4%) of the students are in very active category. This indicates that there is an increase in learning activities of students individually and on average at a rate of 37%. Comparison before and after can be described graph as follows:

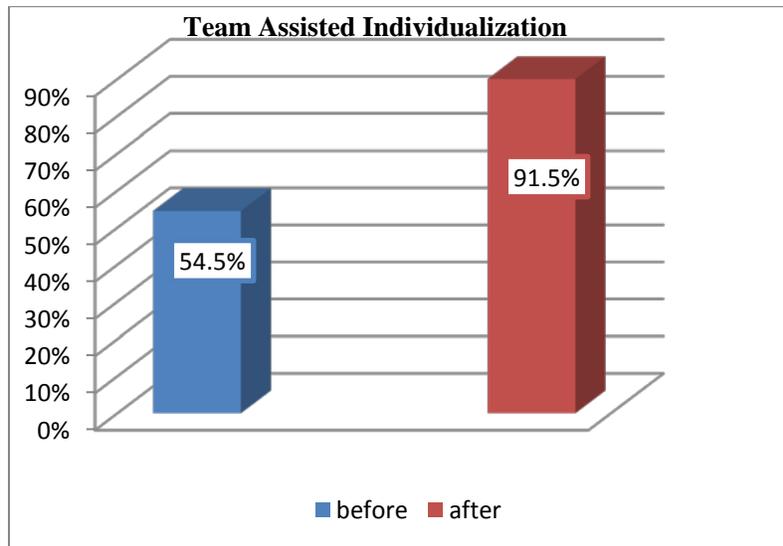


Figure 1. The results of observation before and after the application of the TAI Learning model

1.2.3 Implementation of team assisted individualization team learning model

Implementation of learning model is done as much as 4x to 5x meeting in experiment class 1. Implementation of team assisted individualization learning model follows the terms and rules of learning model steps that have been set by some source. The observation result of learning model implementation is converted into value to be interpreted. The results of the implementation of the team assisted individualization learning model can be seen in table 4 below.

Table 4. Implementation of team teaching model assisted individualization

Weeks	Percentage	Criteria
1	71.4%	Good
2	85.7%	Very Good
3	100%	Very Good
4	100%	Very Good
Average	89.3%	Very Good

The results of the implementation of the team assisted individualization learning model (table 4) shows that the implementation at the first meeting obtained a percentage of 71.4% which falls to the very good category. That is, the implementation of the team assisted individualization learning model at the 1st meeting is still not structured or there are some steps of the team assisted individualization team learning model that has not been applied. The implementation of the team assisted individualization learning model at the second meeting increased by 14.3% becoming 85.7% which falls to the very good category. That is, the implementation of the team assisted individualization learning model at the second meeting began to improve because of the mistakes in the implementation of the model of assisted individualization team learning began to be minimized. The implementation of the team assisted individualization learning model in the third and fourth meetings obtained a percentage of 100% which falls into a very good category. This shows that the implementation of the team assisted individualization learning model at the 3rd and 4th meetings meet the applicable terms and conditions. The average implementation of the team assisted individualization learning model for 4x meetings was 89.3% with very good category. That is, the learning model assisted individualization team implemented according to terms and conditions optimally.

1.3 Effect of Learning Model of scramble on learning activities of students

1.3.1 Use of Scramble learning model

Regression analysis is also done on the model of cooperative type learning scramble to see the effect on the learning activities of students on IPS subjects. The regression estimation model used is also the same ie $Y = a + bx$ to see the magnitude or the contribution of the learning model of the scramble to the students' learning activities. Results of data processing regression with the help of SPSS 24.0 program for this learning model can be seen in table 5 and table 6 as follows.

Table 5. Use of Scramble learning model

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2691,070	1	2691,070	755,044	,000
	Residual	117,616	33	3,564		
	Total	2808,686	34			
	R			,979		
	R Square			,958		
	Adjusted R Square			,957		
	Std. Error of the Estimate			1,888		

The result of using scramble learning model (table 5) shows that the value of F calculated 755,044 with sig level. $0,000 < 0,05$, which means that the learning model has significant effect on the learning activities of the students. The value of R square = 0.958 means the contribution of learning model scramble to learning activity of 95.8%, while 4.2% is determined by other factors. The result of regression coefficient of learning model of scramble can be seen in table 6 below.

Table 6. Coefficient of learning model of Scramble on learning activities of students

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-38,542	3,584		-10,755	,000
	Learning Activity	1,131	,041	,979	27,478	,000

Based on the regression estimation model used, $Y = -38,542 + 1,131 X$. The constant value of -38,542 shows that without the use of scramble learning model, student learning activity is also below average. The value of t arithmetic 27,478 and sig level. $0,000 < 0,05$, meaning each use 1 unit of learning model of scramble will increase 1,131 unit of students activity learning.

1.3.2 Description of learning activities of students

The activities in the experimental class-2 in the application of the scramble learning model show the result of the improvement of students' learning activity on the social studies subjects. The impact of this activity is seen through the observations made before and after the application of the scramble learning model. The results of learning activities are interpreted into several criteria that can be seen in table 7 below.

Table 7. Rating criteria before and after use of scramble learning model

Score	Criteria	Before		After	
		Student	%	Student	%
86 - 100	Very Active	0	0%	15	42.9%
71 - 85	Active	4	11,4%	20	57.1%
56 - 70	Enough	21	60%	0	0%
41 - 55	Less Active	10	28,6%	0	0%
0 - 40	Very Less Active	0	0%	0	0%
	Total	35	100%	35	100%
	Smallest score	42		72	
	Highest score	76	59%	100	86%
	Interpretation	Less Active		Very Active	

Table 7 shows the differences in learning activities of students in the learning process before and after being given a model of experimental learning in the classroom experimental study 2. Before the use of learning model scramble is known the smallest value of experimental class 2 is 42 and the highest score is 76 with an average score of 59% active. The level of learning activity of the learner before the use of the instructional model is sufficient. That is, the students in the experimental class have average learning activity (normal). However, individually known as many as 10 (28.6%) of the students are in less active category, 21 (60%) students are in enough active category, and 11 (11.4%) of the students are in very active category. Most students in experiment 2 class have sufficient learning activity. However, for classical learning this is doubtful let alone some students are in the less active category.

After the implementation of the scramble learning method the smallest value in experiment class 2 is 72 and the highest value is 100 with an average value of 86% which is in the very active category. Individually known as many as 20 (57.1%) of students who are in the active category and as many as 15 (42.3%) of the students are in very active category. This indicates that there is an increase in the learning activities of students individually and on average by 27%. The comparison of before and after of students treated with scramble learning model can be drawn on the graph as follows:

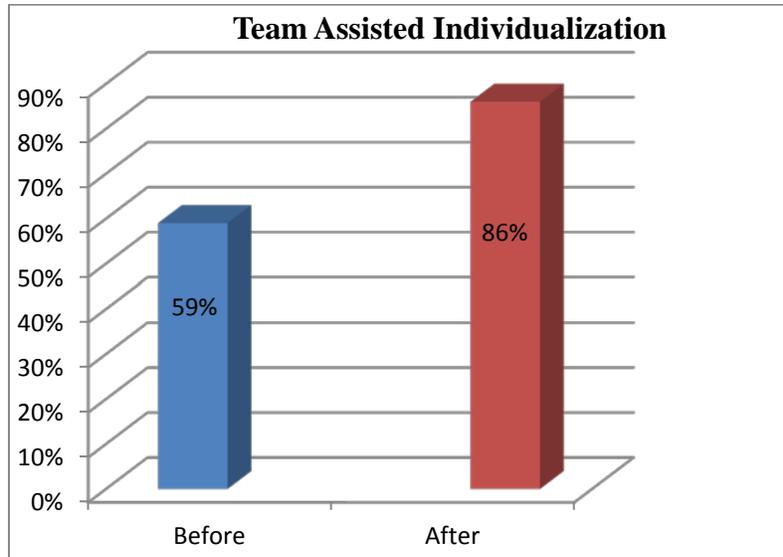


Figure 2. The results of observation before and after the application of the Scramble Learning model

1.3.3 Implementation of the Scramble learning model

The implementation of the scramble learning model is 4x out of 5x meetings in the experimental class 2. The implementation of the scramble learning model follows the terms and rules of the scramble learning model steps that have been set by several sources. The result of observation of the implementation of the scramble learning model is converted into value to be interpreted. The results of the implementation of the scramble learning model can be seen in table 8 below.

Table 8. Implementation of scramble learning model

Weeks	Percentage	Criteria
1	77.8%	Good
2	88.9%	Very Good
3	100%	Very Good
4	100%	Very Good
Average	91.7%	Very Good

The results of the implementation of the scramble learning model (table 8) shows that the implementation at the first meeting obtained a percentage of 77.8% which falls into the good category. That is, the implementation of the scramble learning model at the 1st meeting has not been applied optimally because there are several steps of scramble learning model that is not or has not been applied. Implementation of scramble learning model at the second meeting increased by 11.1% becoming 88.9% which falls into the very good category. That is, the implementation of the team assisted individualization learning model at the 2nd meeting began to improve and the application of learning models of scramble begin to be structured and according to the rules. Implementation of scramble learning model at the third and fourth meeting obtained a percentage of 100% which falls into the very good category. This suggests that the implementation of the scramble learning model at the 3rd and 4th meetings is carried out in accordance with the scramble learning steps. The average implementation of the scramble learning model for 4x meetings was 91.7% with very good category. That is, the learning model scramble implemented according to procedures that have been set optimally.

1.4 Comparison of TAI and Scramble learning models

1.4.1 Comparative test of learning model

In line with the initial objective of this study which is to examine the use of team assisted individual model and scramble learning model and compare these two learning models to see the differences between the team assisted individual modeled learning model and

the learning model of the scramble on the learning activities of the students in the social studies subjects. Comparison of learning models used t test with the help of SPSS 24.0 obtained the output results in table 9 and 10 as follows.

Table 9. Group statistics cooperative learning model

Learning Model		N	Mean	Std. Deviation	Std. Error Mean
Learning	TAI	35	92,6571	5,45000	,92122
Activity	Scramble	35	86,7429	7,86782	1,32990

Table 9 shows that the mean value of the team assisted individualization learning model is 92.6 while the mean value of the scramble learning model is 86.7. That is, the level of learning activity through the team assisted individualization team learning model is higher than the level of learning activity through the scramble learning model. Comparison of further cooperative learning model can be seen in table 10 as follows.

Table 10. Comparison of learning models

		Levene's Test		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Lower Upper	
Learning activities	Equal variances assumed	4,590	,036	3,656	68	,001	5,91429	1,61780	2,68601	9,14256
	Equal variances not assumed			3,656	60,522	,001	5,91429	1,61780	2,67877	9,14980

The statistical results of t-test (table 10) is the t value of 3.656 with sig value. $0.000 < 0,05$ which means the H_0 is rejected and H_a accepted. This means that there is a significant comparison between the cooperative learning model type assisted individualization team with a model of learning scramble on learning activities of students on social studies subjects.

1.4.2 Differences in the use of TAI learning models with Scramble based on observations

The comparison is being given between the use of cooperative learning model in experimental class 1 and in the experimental class 2. The learning model of team assisted individualization in the experimental class has the contribution value of 89.7% and the experimental model of experimental class 2 has a contribution value of 95.8%. The results of the analysis show that the use of Scramble learning model has advantages over the Team Assisted Individualization learning model. However, a difference of 6.1% cannot be ascertained that the scramble learning model is better than the team assisted individualization learning model. Overall, the Team assisted individualization learning model is rated better than the scramble learning model.

The use of the team assisted individualization learning model can increase the learning activities of students from less active to be very active. The statistical results show that the use of 1 unit of learning model assisted individualization team can increase as much as 1.906 units of learning activities of students while the use of 1 unit of learning model of scramble can increase 1,131 units of learning activities. That is, the use of team teaching model assisted individualization has a higher influence than the model of learning scramble. This is evidenced through the influence of the use of learning model with regression analysis and comparison of previous learning model. In addition, this difference can also be seen from the observation before and after the implementation of experimental learning model class that can be seen in Figure 3 below:

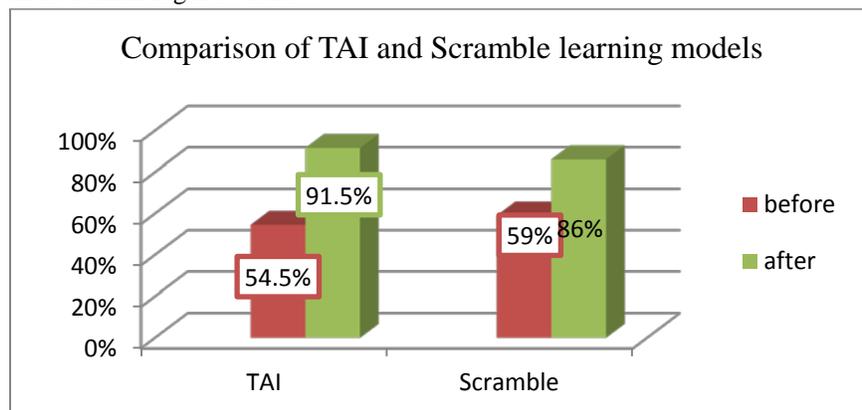


Figure 3: differences before and after the use of learning models

Based on Figure 3 it is known that the increase of student learning activity in experiment-1 class is 37% while in class of experiment-2 is 27%. A 10% difference indicates that the team assisted individualization learning model is better than the scramble learning model. Ideally, the previous t-test should support this assumption. It was concluded that the learning model of team assisted individualization type was superior to the cooperative model of the type of scramble to improve or trigger the learning activities of the students in the social studies subjects.

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V. FINDING

At the time of using cooperative learning model in experiment 1 and experiment 2 class were found some benefits and constraints of the team assisted individualization model and the scramble learning model. Some of the benefits of implementing the team assisted individualization learning model can be explained as follows. First, quiet students (rarely communicate or alienated) are getting used to communicating with other students. Second, students who do not dare to express opinions become more daring to express their opinions. Third, the quiet classroom becomes noisy because of the "light up" learning activity. Fourth, caring, helping each other, respect, and responsibility towards fellow students gradually increase. Fifth, the loss of status (rich vs poor) among students. Sixth, the relationship between teachers and students become closer. On the other hand, there are some obstacles encountered when implementing the team assisted individualization learning model. First, the timing of group learning is often missed, requiring additional time. Second, the less intelligent students will rely on clever students. This dependence can lead to debate and hostility between them. Third, the "lighted" classroom atmosphere can interfere with learning activities in other classes.

The findings of the study on the use of the scramble learning model are not much different from the use of the team assisted individualization learning model. There are several different and evolving points of application of this model. First, the social life of students (such as responsibility, cooperation, caring, and help) increases directly. Second, the structure of group cooperation shapes the soul of the leadership of the students so that they share their duties and are responsible for the tasks they get. Third, the psychological needs of students develop and increase (such as pleasure, smile, attention, reaction, and relaxation) because this learning model combines games and learning (Shoimin, 2013). Fourth, the accuracy and discipline of students on the learning process improves the power of concentration and ability of memory and thinking power. This is known from the results and learning achievements of students. Fifth, the participants' learning motivation gradually increases. And on the use of Scramble learning model some obstacles are also found. First, when students answer questions from teachers. Students need additional time to answer the question sheet. Second, the scramble learning model cannot be applied to certain subject matter (such as learning materials that require creativity or critical thinking).

VI. CONCLUSION

The cooperative learning model of team assisted individualization and scramble type is very effective to solve academic problems (such as learning outcomes, learning achievement, learning activities), psychological problems (such as learning behavior, thinking ability, skill, happiness, comfort) and social problems (such as cooperation, respect, social relations, communication, responsibility, status and gender differences). This cooperative learning model is very suitable to be applied to IPS subjects or subjects that relates with theoretical studies.

The learning model of team assisted individualization and the scramble learning model have some similarities. First, the team-assisted individualized learning model and the scramble learning model focus on the students so that the learning activities they perform (see, perform, argue) will have an impact on their memory. Second, the team assisted individualization modeled learning model and the scramble learning model trigger students' learning activities during the learning process so that they are motivated and become active. Third, the learning model of team assisted individualization and learning model scrambles remind teachers to respect their students. Fourth, the team learning model assisted individualization and the scramble learning model strengthen the relationship of teachers and students.

The learning model of team assisted individualization and the scramble learning model also have some differences (such as focus, purpose, and function). The first difference refers to the focus of the learning model, the team assisted individualization teaching model focuses on peer tutors to help group members understand the subject matter while the scramble learning model focuses

on the accuracy and speed in understanding the subject matter. The second difference refers to the purpose of the learning model, the team assisted individualization learning model aims to establish external relationships while the scramble learning model aims to develop internally. The third difference refers to the function of the learning model, the model of assisted individualization team learning has the function of eliminating status differences (rich vs poor, race, culture, etc.) while the scramble learning model serves as a forming of a competitive personality.

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Effect of Counseling Based Social Skills Treatment of Secondary School Students with Skills Deficit in Chanchaga Suburb of Minna, Niger State of Nigeria

Dr John Jiya

PhD, University of Abuja), Department of Counseling Psychology, Ibrahim Badamasi Babangida University, Lapai.,Nigeria

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Abstract- The study was designed to investigate the effect of Counselling in promoting the social skills of secondary school students who are socially challenged based on the adapted socialability questionnaire measures. Experimental design and cluster sampling were employed with a sample size of 205 subjects. It was found that no significant difference existed between pre-treatment scores of the two schools but there was positive treatment effect on the pre-treatment and post-treatment measures of the experimental and control groups at 0.05 level of significance. In addition post treatment social skills scores of students with low skills showed significant improvement at 0.05 level of significance. It was recommended that social skill dimension of educational delivery which is sub-summed in the affective domain of Benjamin Bloom's taxonomy of behavioural objectives be made more prominent. Also counsellors should be employed and provided the resources and authority to add value to school practice.

Index Terms- Social skills, counselling, deficits and treatment.

I. INTRODUCTION

Social skills is at the base of meaningful positive interaction with people. Greshan and Elliot (1984) defined it as socially acceptable learned behavior that enable a person to interact with others in ways that elicit positive responses and assist in avoiding negative responses. Wingert (2002) asserts that researchers now know that success in life and personal happiness depends, to a great degree on an individual's "emotional intelligence" - the ability to function well in a group and to form meaningful relationship. Hope Finch and McConnel (1983) said that the ability to form effective and meaningful social relationship has long been considered critical to human development. The Nigeria National Policy on Education states as one of the national educational goals:

The acquisition of appropriate skills and the development of mental, physical and social abilities and competence as equipment for the individual to live and contribute to the development of the society (FRN, 2004:8).

Nigeria Government through her policy on education has acknowledged the need and importance of social competencies in human development. A cursory view of Nigeria public life points severally to the need for increased social capacities. Marital

conflicts, work-place rivalry and weak team spirit/work, religious and ethnic conflicts etc. indicates social skills deficits.

A social skills deficit perspective assumes that specific identifiable skills form the basis for socially competent behavior and that interpersonal difficulties may arise as a result of a faculty behavior repertoire (Bellack and Hersen 1979 and McFall 1982). Some children or teenagers are drawn to peers and seem to thrive on social interaction whereas others appear rather unsociable and even withdrawn. Hartup in Wingert (2002) said that;

Children, who are aggressive and disruptive, who are unable to sustain close relationships with other children and who cannot establish a place for themselves in the peer culture are seriously at risk (P:103).

Invariably poor social skills could result in difficulties in interpersonal relationships with peers, teachers and parents. It could generate highly negative response from others to lead to high level of peer rejection. It can compromise the intellectual growth that usually results from group studies or group discussion and academically inspired peer consultation.

O'Connor (1972) examined the contributions of shaping procedures to symbolic modelling. His finding indicated that modelling alone increased social interaction. Evers and Schwarz (1973) attempted to replicate and extend O'Connor's work and found that modelling, with or without contingent teachers' praise increased positive peer interaction. Also improvement above post-treatment levels resulted for both groups at follow-ups.

Lad (1981) in a study of specific verbal skills training is remarkable in its demonstration of changes in both behavioural and socio-metric indicators of social competence. Studies by Lagreca and Santogrossi (1980) indicated that skills-training group improved in skill knowledge, role play performance and behavioural observations of initiation of peers relative to the attention-placebo and waiting-list control groups. Odoemelan (1994) investigated the relative effectiveness of social skills training, conversational skills training and modelling on some behavior problems and found the treatments to be successful in reducing and minimizing the problems. The problems included: inability to learn, inability to maintain satisfactory interpersonal relationships with people, inappropriate types of behaviours, pervasive mood of unhappiness or depression etc. Gerler (1985) posits that interpersonal skills was generally effective with elementary students. The efficacy of classroom-based social-competence programmes is also supported in the work of

Weissburg, Caplan and Harwood (1991). They concluded that the short-term benefits of social skills training have been established for preschool, elementary, middle and high school students (Erford, 2007).

This study is essentially about how to enhance the social skills of secondary school students in a multi-ethnic and multi-religious setting. The two schools are co-educational public schools. The study will involve the grouping of the sample into subjects that will be exposed to counselling treatment and the control group. The effectiveness of counselling will be determined. The overall objective of the study is to provide basis for formalization of the remediation of social skills challenges via counselling in Nigerian schools.

II. STATEMENT OF THE PROBLEM

This study is about secondary school adolescents who are socially challenged. The primary target group for social skills intervention are students with low socio-metric status particularly those who show evidence of poor social competence like shyness, social withdrawal, under assertiveness, isolation from peers, anxiety and lack of reinforcement from peer interaction and excessive aggression. The study is designed to achieve the following ends:

- (i) Identification of secondary school students with low social skills
- (ii) Determine the effectiveness of counselling based treatment of social skills enhancement

III. PURPOSE OF THE STUDY

The purpose of this study is to provide basis for the formalization of social skills remediation programme for secondary school students who are socially challenged through the counsellor, as an important school personnel. The specific objectives include:

- (i) Determine the existence of the problem of social skills deficit in secondary school students
- (ii) Determine the effect of counselling inspired social skills intervention with a view to enhance the adjustment of secondary school students at risk of social challenges.

IV. RESEARCH QUESTION

The following research questions guided the study

- (i) Are there social skills deficit in secondary schools?
- (ii) What is the extent of social skills deficits in secondary school students?
- (iii) What will be the difference in the social skills of student in terms of pre-treatment and post treatment measures?

V. HYPOTHESES

The following null hypotheses were tested at 0.05 level of significance.

H0₁: There is no significant difference in the pre-treatment social skills status of students in the two schools.

H0₂: There is no significant difference in the pre-treatment and post-treatment social skills scores of secondary school students exposed to counselling based treatment and those not exposed to the treatment

H0₂: There is no significant difference in the pre-treatment and post-treatment social skills measures of secondary school adolescents with low social skills after a circle of counselling session.

VI. METHODOLOGY

The study is experimental and employed the randomized subjects pre-test post-test control group design.

Population and Sample

The population consists of secondary school students in Chanchaga suburb namely:

- (i) Government Day Science Secondary School, Chanchaga - Minna
- (ii) Government Day Secondary School, Chanchaga - Minna

The focus is on first year senior secondary school students i.e. SSS one. Part of the basis for choice of these schools is the presence of Guidance Counsellors and the ethnic heterogeneity of the schools.

Cluster sampling was used to select a classroom that served as experimental group and another classroom as control group in each of the two schools. A sample size of 205 was drawn from total school population of 1,534 year one students of the two schools.

Instrument for Data Collection

The socialability questionnaire used derives from two instruments namely:

- (i) The socialability questionnaire: an index of skill, designed by Jonathan Berent' and associates.
- (ii) Self-esteem inventory by Stanley Coppersmith of the University of California.

Validation of Research Instrument

Face validity of the instrument was achieved through inspection and corrections by three professors of counselling psychology who rated the instrument as capable of yielding appropriate measures for testing the hypotheses.

The reliability was ascertained through test-retest method. The questionnaire was administered to year one students of Army Day Secondary School, Minna twice with an interval of three weeks. The Pearson Product Moment Coefficient of Correlation was used to calculate reliability coefficient index of 0.87.

Administration of the Instrument

The researcher in collaboration with two counsellors in each of the schools administered the questionnaire for each school, questionnaires was responded to in the class at the same time by all subjects but there was no time limit and there was no opportunity for students to consult fellow students. They were assured that there were no rights or wrong answers. Subjects had

the opportunity to seek clarification from test administrators on any item that was not clear to anyone of them.

Treatment Procedure

The treatment or experimental groups were exposed to nine (9) sessions of the social skills programme. It was a five (5) week of two sessions per week treatment programme for the experimental group (N = 97) except for the 5th week which had one session. The period of treatment was 11th February 2017 to 14th March 2017. During the treatment period students were instructed on the basis of the guide lines provided in the social skills programme which clearly spell out in a user-friendly fashion, aspects such as; the topic, specific skills to be developed in the subjects, objectives, introduction, activities designed to bring about the development of the identified skills and assignment to help the subject practice the skills.

Areas of social skills covered include conversation, group entry or joining an ongoing activity, smile and have fun,

assertiveness, social problem solving, cooperation, complimenting, awareness of feelings and good sportsmanship.

Grading and Interpreting the Results

When grading the test, assign each correctly answered question a value of one (1). The correct answer implies what a socially well adjusted person will give as answer.

The following table will serve as a general guideline for determining social skills status:

- Low social skills status: 21 and below
- Medium social skills: 22 – 34
- High social skills status: 35 – 44

VII. THE RESULTS

Hypotheses one: There is no significant difference in the pre-treatment social skills measure of students in the two schools.

Table 1: t-test comparison of pre-treatment social skills scores of the two secondary schools.

Group	N	Mean	SD	t-calculated	t-critical	DF
Government Day Science Secondary School	101	20.81	4.87	0.42	1.96	
Government Day Secondary School	104	20.51	4.40			203

P. <.05

The mean (\bar{x}) of social skills score of Government Day Science Secondary School, Chanchaga is 20.81 while that of the Government Day Secondary School, Chanchaga is 20.51. The t-calculated of the analysis of the mean is 0.42 while that the t-critical is 1.96 meaning that the t-calculated is less than the t-tabulated. Therefore the hypothesis that states that there is no significant difference in the pre-treatment social skills scores of the two schools (i.e. GDSS and GDSS) is not rejected at 0.05 level of significance.

Hypothesis Two: There is no significant difference in the pre-treatment and post-treatment social skills scores of secondary school students exposed to counselling based social skills treatment and those not exposed to the treatment.

Table 2: t-test comparison of the social skills status of control and experiment group of secondary school students.

Group	N	Mean	SD	t-calculated	t-critical	DF
Control group	108	26.96	5.65			
Experimental Group	97	28.60	5.34	2.78	1.96	203

P. < 0.05

The mean (\bar{x}) of the control group, that is, subjects that were not exposed to treatment is 26.96 while that of the experimental group, that is, subjects that participated in the counselling based social skills treatment is 28.60. The calculated t-test value is 2.78 while the t-critical is 1.96 implying that the t-calculated is greater than the t-tabulated. Therefore the hypothesis that states that there is no significant difference in the social skills status of secondary school students exposed to treatment and those not exposed to treatment is rejected at 0.05 level of significance. In other words, there is significant difference in the social skills of students exposed to counselling based social skills treatment when compared with that of students not exposed to the treatment.

Hypothesis three: there is no significant improvement in the social skills status of secondary school students with low social skills after a circle of counseling sessions.

Table 3: t-test comparisons of pre-treatment and post-treatment social skills measures of secondary school students with low social skills.

Group	N	Mean	SD	t-calculated	t-critical	DF
Pre-test low	23	19.04	2.39			
Post-test low	23	21.35	4.93	2.63	2.07	22

P.< 0.05

The mean of pre-treatment social status score of subjects with low social skills status, that is, subject with a score of 21 and below, is 19.04 while the post-treatment mean of the set of students is 21.35. The t-calculated is 2.63 while the t-critical is 2.07 meaning that the t calculated is higher than the t-critical. Therefore the hypothesis that states that there is no significant improvement in the social skills measures of secondary school students with low social skills after a circle of counselling session is rejected at 0.05 level of significance. In other words there is a significant difference in the pre-treatment and post-treatment scores of secondary school students with low social skills on account of the counselling based social skills programme.

VIII. DISCUSSION OF FINDINGS

No significant difference was found in the pre-treatment social skills measures of the two schools with means of 28.81 and 28.51 suggesting a generally medium social skills rating. However standard deviations of 4.87 and 4.40 respectively suggest a likely gap between students with relatively high social skills and those with low skills. This narrative confirms the need for social skills training as expressed in the Nigeria National Policy on Education that part of the educational goals should be the development of social competence as equipment for the individual to live and contribute to the development of the society. Therefore the educational goal is as appropriate and germane as ever.

Significant difference was found in the social skills measures of students exposed to the counselling based social skills treatment when compared with that of subjects not exposed to the treatment. In other words there was positive treatment effect for the experimental groups compared with control group. This implies further significant contribution to the pool of social skills research on adolescents such as the works of O'Reilly and Glynn (1995), Gerler (1985) and Weissburg, Caplan and Harwood (1991) which showed that teaching more general social skills to adolescents might also be effective at promoting social skills of subjects. This study further confirms that social skills enhancement programmes when deliberately planned and carefully implemented can remarkably improve the social skills of adolescents who may be socially challenged.

The difference in the pre-treatment and post-treatment mean scores of social skills of the students with low social skills was significant. This showed the effectiveness of the counselling based social skills programme. This result corroborate the findings of Odoemelan (1994, 2006) O'Connor (1972) and Evers and Schwarz (1973) who reported improvement even above post-treatment assessment level, that is, at follow-up stage therefore providing bases for the generalizability of acquired social skills.

IX. CONCLUSION

The resourcefulness of guidance and counselling in addressing the social skills challenges of secondary schools students is not in doubt. The conditions in the schools are a far cry from the minimum standards set in the educational policy.

For example, counsellors were given teaching responsibilities, some are serving as examination officers in addition to membership of committees, meanwhile the counsellor – student ratio is within the region 1:2,000 or above. The prevailing waste in schools in terms of the gap between years spent in school and the functioning capacity of products of school is partly a reflection of our insensitivity to research initiative and findings.

X. RECOMMENDATIONS

Teachers, counsellors, educational psychologists and other relevant school personnel should be encouraged to develop tests for assessment of social skills needs of learners. The prevailing practice of little or no emphasis on the affective domain in the statement of behavioural objectives should be discouraged through responsive supervision and need-based retraining.

The study has shown the need for more effort to design appropriate user-friendly social skills programmes for boys and girls that can be used by teachers, counsellors, parents and even learners as a form of self-instructional module.

Full-time counsellors should be provided in schools as prescribed in the National Policy on Education (FRN, 2004) The study also revealed the need for constant retraining of counsellors to help up-date their knowledge and skills in keeping with contemporary development.

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AUTHORS

First Author – Dr John Jiya, PhD, University of Abuja), Department of Counseling Psychology, Ibrahim Badamasi Babangida University, Lapai.,Nigeria, E-mail: jiyako4real@yahoo.com, Phone: +2348035916598

Investigating Mathematics Teachers' Awareness in the Use of Modeling in Mathematics Education

¹IJI, C. O. Ph.D, ²ABAKPA, B. O. Ph.D, ³AGBO-EGWU, A. O. Ph.D,& ⁴FEKUMO, B.

^{1,2,3}Department of Science Education, University of Agriculture, Makurdi.

⁴Senior Secondary School, Bulou-Orua, Bayelsa State.

Correspondence email: ijiclements07@yahoo.com

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Abstract: *This study investigated the use of modeling by mathematics teachers in their teaching of mathematics. In the specific objectives, it sought the mathematics teachers' awareness in the use of modeling in mathematics education as well as the level of utilization. The study was conducted in Kolokuma/Opokuma local government area of Bayelsa state in Nigeria. It adopted a survey research design with a population of 47 mathematics teachers in ten secondary schools. A sample of 20 out of this population was used. To arrive at this, purposive sampling technique was used. Instrument for data collection was Modeling Awareness Inventory (MAI) which was validated by experts. The instrument was trial tested using Cronbach Alpha formula and had a reliability coefficient of 0.86. Descriptive statistic was used to answer all the research questions asked. It was found among others that Majority of the mathematics teachers in Kolokuma/Opokuma local government area are not aware of modeling in mathematics education. Suggestions on how to improve their awareness were also made.*

Keywords: Teachers Awareness, Modeling, Mathematics Education.

Background of the Study

The instability of our economy due to much dependence on oil as the major source of income has been of great concern. That is why Nigeria today, in diversifying the economy emphasizes on developing her agricultural sector. The idea that agriculture could serve as viable and suitable source of income for the stabilization of our devastating economy is not out of place. To sustain these for meaningful development, mathematics education is a prerequisite.

Mathematics is an indispensable tool which has its contributions virtually in all spheres of life including agriculture. The importance of mathematics is known to be an essential discipline recognized globally, hence, agriculture cannot be practiced without mathematics. This is obvious because mathematics plays a vital role towards the development of agriculture, such as ascertaining the volume of crop that needed to be produced, based on the output and demand of the previous year. Also, knowing the quantity of chemical that is needed to induce the hatching of the eggs to fingerlings and the capacity of the fingerling that each pond should contain, all depends on mathematical knowledge. In addition, mathematical skills assist the evaluation of investment in trucks and storage tanks.

It is necessary to develop in learners the knowledge, reasoning capacity and problem solving skills required for such development. Today's world expects mathematics teachers to raise individuals who are able to create effective solutions in cases of

real problems and use mathematics effectively in their daily lives. Hence it is obvious that mathematical development of the learner has a great consequence for the agricultural development of the nation.

In spite of the importance of mathematics, it is very disappointing to note that students' achievement in the subject has remained consistently low (Uche, 2011). Students' lack of understanding of concepts in mathematics inevitably results in poor performance at external examinations and backwardness in technological and agricultural advances in our nation. This according to Jonah-Eteli (2007) and Ogunkunle (2007) is as a result of poor teaching approach and lack of awareness by mathematics teachers of recommendation from researches and professional organizations in mathematics education. There is no doubt that teachers play a major role in creating the environment in which students can best learn mathematics. Besides the mathematics teachers' content knowledge, his/her pedagogical approach is very essential.

One of the best ways to make mathematics concrete is to teach the lessons through relating or integrating. Students achieve a better understanding of mathematics in this way (Holmes, 2006).

Martin (1984) in Iji (2010) proposes for a general reorientation of mathematics education aiming at a mathematics that will be a useful tool for the majority of the students. Specifically, he stated that mathematics should be taught in such a way that it will perform the role of solving multidisciplinary problem of the students. This he said should be done through modeling methods that will restore students' interest and show mathematics as being useful.

Mathematical modeling is the transformation of any problem situation into a mathematical model. Most mathematicians, scientists, and engineers would agree that modeling involves using mathematics to distill key elements of real-world phenomena in order to articulate the relationships among these elements (Spandaw, 2011). To Heck (2010), mathematical modeling-based teaching activities make contribution to students' meaningful learning of both sciences and mathematics topics.

Thus, owing to the important contributions to education and training, mathematical modeling practices are applied and used in the establishment of daily life (Perry and Todder, 2009; Saglam-Arslan and Arslan, 2010). Literature indicate that mathematical modeling practices enhance conceptual developments of individuals, their interdisciplinary relating capabilities (Munier and Merle, 2009), development of their modeling abilities and their use of their mathematical knowledge (Blomhoj, 2007; Blomhoj and Kjeldsen, 2007). Their social skills, their inter-disciplinary skills, conceptual structures in mathematics and in the related disciplinary, their skills for coping with situations encountered in their daily life, as well as their team work and problem solving skills (Klymchuk *et al.*, 2008).

Moreover, mathematical modeling has been explicitly included in national curriculum standards in various countries. For example, in the United States, real-world applications and modeling are recurring features throughout the Common Core State Standards for Mathematics (CCSSM; National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010).

One may be wondering how mathematical modeling differs from what one already teach, particularly, "problem solving". Problem solving may not refer to the outside world at all. Even when it does, problem solving usually begins with the idealized real-world situation in mathematical terms, and ends with a mathematical result. Mathematical modeling, on the other hand, begins in the "unedited" real world, requires problem formulating before problem solving, and once the problem is solved, moves back into the real

world where the results are considered in their original context. However, despite the increased interest in mathematical modeling, a large number of questions remain unanswered (Lesh & Fennewald, 2013).

Mathematical modeling is today considered a 21st century skill (English & Sriraman, 2010). Enabling students to explore relations between mathematics and the real world is an explicit goal in many mathematics curricula (Common Core State Standards Initiative, 2012). Considerable research has been devoted to explore how mathematics teachers from different grade levels solve modeling problems (Blum & Borromeo Ferri, 2009) and to describe their beliefs and conceptions of the role of modeling activities in the classroom (Kaiser and Maass, 2007). However, little is known about teachers' awareness about mathematical modeling. Thus the study is to investigate mathematics teachers' awareness in the use of modeling in mathematics education.

Objective of the Study

The main purpose of this study was to find out the extent to which mathematics teachers are aware of the use of modeling in mathematics education. Specifically, the study sought to:

1. Determine the awareness of modeling in mathematics education by mathematics teachers.
2. Determine the utilization of modeling in mathematics education by mathematics teachers.

Research Questions

The following research questions guided the study.

1. To what extent the mathematics teacher is aware of modeling in mathematics education?
2. To what extent do mathematics teachers use modeling in their teaching?

METHODOLOGY

Research Design

The study adopted descriptive survey design. Survey design was used because the population is large such that the study was limited to a sample size. Moreover, it sought and elicited opinion of the subjects on the issue under discussion.

Area of the Study

This study was carried out in Kolokuma/Opokuma Local Government Area of Bayelsa State in Nigeria. Kolokuma/Opokuma Local Government Area is made of two clans namely Kolokuma and Opokuma, and two constituencies, constituency I and II. The Local Government Area is located in the Central Senatorial District of Bayelsa State with the headquarters at Kaiama. It has an area of 361 km². There are nine communities that made up Kolokuma Clan while Opokuma Clan has ten communities. Kolokuma/Opokuma Local Government Area was chosen based on her desire for educational growth which equally led to creation of state of emergency on her education sector in the year 2013.

Population of the Study

The target population for this study comprised the entire Secondary Schools mathematics teachers in Kolokuma/Opokuma Local Government Area of Bayelsa State. It consists of 47 mathematics teachers in the 10 secondary schools. Secondary schools were used because this is the level of school where teachers who have their bachelor degrees in mathematics education do teach the subject, also this level is comprised of both the upper basic education levels and senior secondary level of education.

Sample and Sampling Techniques

The sample size was 20 mathematics teachers in the ten Secondary Schools in the two constituencies (I and II) in the Local Government Area with two mathematics teachers in each of the schools. The sample consists of one upper basic mathematics teacher and one secondary school mathematics teacher. To obtain this sample, purposive sampling technique was used. The mathematics teachers were purposively chosen for the study.

Instruments for Data Collection

A Modeling Awareness Inventory (MAI) containing ten (10) items was developed by the researcher and used for the study. The MAI is a questionnaire of two sections which solicits for information on mathematics teachers' awareness in the use of modeling in mathematics education, and the utilization of modeling in mathematics education by teachers. The MAI is on a four-point scale (Strongly Agreed, Agreed, Disagreed and Strongly Disagreed).

Validation of the Instrument

A Modeling Awareness Inventory (MAI) containing twenty (20) items was given to two experts in mathematics education and two experts in measurement and evaluation to ascertain the face validity. They assessed individual items on agreement with answer, clarity of the item, and suitability phrasing to enable subjects respond adequately to the questions. Repetitive items were removed by the experts. After removing unsuitable items, the corrections were used to produce the final instruments of 10 items.

Reliability of the Instrument

A trial test was done with 10 Secondary School mathematics teachers outside the study area and a reliability coefficient of 0.86 using Cronbach Alpha formula was obtained.

Method of Data Collection

The instrument was administered to the respondents and collected after an hour by the researcher. Thereafter, the instrument was subjected into data analysis.

Method of Data Analysis

Data was analyzed using descriptive statistics of mean and standard deviation. An overall mean of 2.5 and above was considered to have had awareness as well as utilized modeling in their classes, while below 2.5 is considered to have had no awareness and have not been using modeling in their classes.

Result

Research Question 1

To what extent the mathematics teachers are aware of modeling in mathematics education?

Answer to this research question is presented in table 1.

Table 1: Means and Standard Deviations of Extent Mathematics Teachers are Aware of Modeling in Mathematics Education.

s/n	Items	Means	Standard Deviations	Remark
1	Modeling can be used to promote students interest in mathematics	2.45	0.51	Disagree
2	Modeling can be used to provide students with the opportunity to have a deeper understanding of concepts in mathematics	2.30	0.66	Disagree
3	Modeling can be used to enhance learning	2.35	1.08	Disagree
4	Modeling can be used to help learners communicate among their peers	2.20	0.95	Disagree
5	Modeling reduces boring nature of classes	1.95	0.99	Disagree

Table 1 showed that all the items have means ranging from 1.95 to 2.45 with corresponding standard deviations of 0.51 to 1.08. The analysis showed that mathematics teachers are not aware of modeling in mathematics education.

Research Question 2

To what extent do mathematics teachers use modeling in their teaching?

Answer to this research question is presented in table 2.

Table 2: Means and Standard Deviations of Extent Mathematics Teachers Use Modeling in Their Teaching.

s/n	Items	Means	Standard Deviations	Remark
1	Use models to make students learn mathematics	2.47	0.51	Disagree
2	Use models to make students recall mathematics definitions	2.26	0.65	Disagree
3	I have being using modeling in teaching mathematics	2.16	1.17	Disagree
4	I am competent in using modeling in teaching	2.00	0.88	Disagree
5	I use modeling models in class as a teaching material	2.05	1.13	Disagree

Table 2 showed that all the items have means ranging from 2.00 to 2.47 with corresponding standard deviations of 0.51 to 1.17. The analysis showed that almost mathematics teachers have not used modeling in their classes.

Summary of the Findings

Based on the analyses of data from the study, the following findings were made:

1. Majority of the mathematics teachers in Kolokuma/Opokuma local government area are not aware of modeling in mathematics education.
2. Most of the teachers have not used modeling in their classes.

Discussion

The finding that mathematics teachers are not aware of modeling in mathematics education is not an encouraging one. The last finding that the mathematics teachers do not use modeling in their classes is therefore obvious. This implies that their attentions were not drawn to research recommendations on this subject matter. In other words, supervisory bodies do not show concern on issues that have to do with students learning.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. Institutions that train mathematics teachers should emphasize the use of modeling in teaching mathematics in classes.
2. Schools should ensure that mathematics teachers employ modeling in their classes which could promote effective learning.

Conclusion

Considering the fact that modeling enhances effective learning in mathematics education, this study has shown that mathematics teachers need to be encouraged to incorporate modeling in the subject. Teachers in the study area are not aware of modeling in mathematics and have not adopted it in the teaching, therefore, it is stressed that teaching should be done such that learners are able to incorporate concepts learnt into their daily lives.

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Electromyogram (EMG)

Aniket Bari

* Department of electrical engineering, Government College of Engineering, Jalgaon.

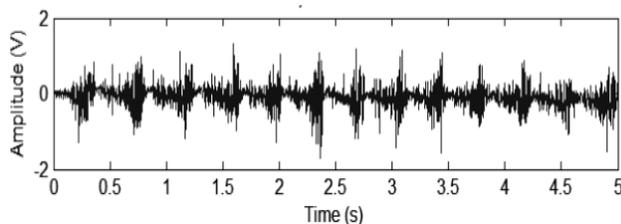
DOI: 10.29322/IJSRP.8.9.2018.p813

<http://dx.doi.org/10.29322/IJSRP.8.9.2018.p8113>

Abstract- Electromyography signal carries valuable information regarding the nerve system. So the aim of this paper is to give brief information about EMG signal detection technique in voluntary muscle movement of human being. In this paper, method is applied to analyze EMG signal with detection, processing and application.

I. INTRODUCTION

Electromyography (EMG) is a technique for evaluating and recording the electrical activity produced by skeletal muscles. EMG is performed using a process of study called an *electromyography*, to produce a record called an *electromyogram*. An electromyography detects the electrical potential generated by muscle cells when these cells are electrically or neurologically activated.



Signal 1: sample EMG

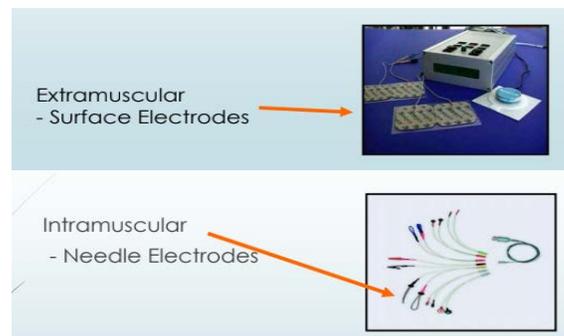
The first documented experiments dealing with EMG started with *Francesco Redi's* works in 1666. Redi discovered a highly specialized muscle of the electric ray fish generated electricity. In 1792, a publication entitled 'Commentary on the Force of Electricity on Muscular Motion' appeared, written by *Luigi Galvani*, in which the author demonstrated that electricity could initiate muscle contractions. After some decades, in 1849, *Emildu Bois-Reymond* discovered that it was also possible to record electrical activity during a voluntary muscle contraction. The first actual recording of this activity was made by *Marey* in 1890, who also introduced the term electromyography. *Hardyck* and his researchers were the first (1966) practitioners to use EMG. In the early 1980, *Cram* and *Steger* introduced a clinical method for scanning a variety of muscles using an EMG sensing device.

There are two kinds of EMG in widespread use: surface EMG and intramuscular (needle and fine-wire) EMG. To perform intramuscular EMG, a needle electrode is inserted through the skin into the muscle tissue. A trained professional (such as a neurologist, physiatrist, or physical therapist) observes the electrical activity while inserting the electrode. The insertion

activity provides valuable information about the state of the muscle. Normal muscles at rest make certain, normal electrical signals when the needle is inserted into them. Then the electrical activity when the muscle is at rest is studied. Abnormal spontaneous activity might indicate some nerve and/or muscle damage. Then the patient is asked to contract the muscle smoothly. The shape, size, and frequency of the resulting motor unit potentials are judged. Then the electrode is retracted a few millimeters, and again the activity is analyzed until at least 10–20 units have been collected. Each electrode track gives only a very local picture of the activity of the whole muscle. Because skeletal muscles differ in the inner structure, the electrode has to be placed at various locations to obtain an accurate study.

Intramuscular EMG may be considered too invasive or unnecessary in some cases. Instead, a surface electrode may be used to monitor the general picture of muscle activation, as opposed to the activity of only a few fibers as observed using an intramuscular EMG. This technique is used in a number of settings; for example, in the physiotherapy clinic, muscle activation is monitored using surface EMG and patients have an auditory or visual stimulus to help them know when they are activating the muscle. A motor unit is defined as one motor neuron and all of the muscle fibers it innervates. When a motor unit fires, the impulse (called an action potential) is carried down the motor neuron to the muscle. The area where the nerve contacts the muscle is called the neuromuscular junction, or the motor end plate. After the action potential is transmitted across the neuromuscular junction, an action potential is elicited in all of the innervated muscle fibers of that particular motor unit. The sum of all this electrical activity is known as a motor unit action potential.

This electrophysiological activity from multiple motor units is the signal typically evaluated during an EMG.



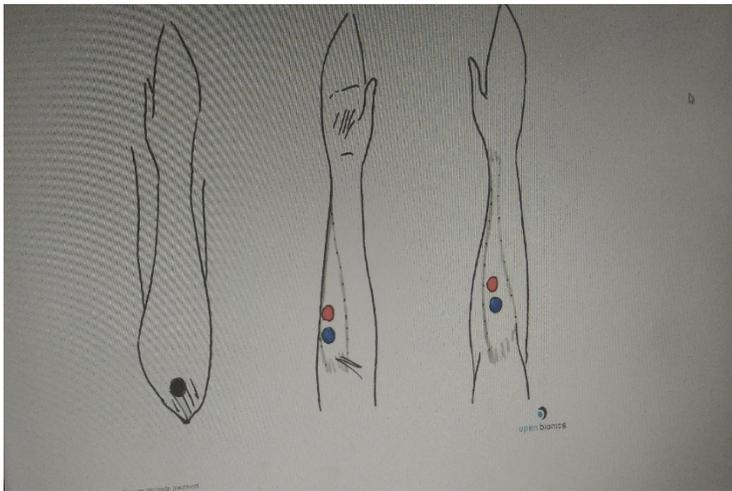


Fig1. Electrode types and placing

II. EMG SIGNAL PROCESSING

There are four basic signal processes in EMG. Each of them has got its own value and function.

1) Amplification:

EMG signal has a very low amplitude. Hence amplifier is used for amplification purpose. The gain of amplifier needs to be high for amplification. The amplifier used is instrumentation amplifier. The signals captured are given to instrumentation amplifier. After amplification, signals are given to filter. This amplifier has a high input impedance to limit the attenuation from electrode-skin interference.

2) Filtering:

EMG is actually a composite of many signals, as well as some noise. These voltages also rise and fall at various rates or frequencies, forming a frequency spectrum. Circuits filter the composite signal and eliminate unwanted and meaningless electrical noise like movement artifact. Because most EMG exists in a frequency range between 20 and 200 Hz, and because movement artifacts have frequencies less than 10 Hz, that is the cutoff frequency frequently employed in "high-pass" filters.

3) Rectification:

As the raw signal is biphasic, its mean value is zero. The rectifier allows current flow in only one direction, and so "flips" the signal's negative content across the zero axes, making the whole signal positive.

4) Signal Processing:

For EMG signal processing, following softwares are used

- 1) MATLAB
- 2) Arduino

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins. These pins are used for

interfacing external components. The program is loaded in arduino through computer using USB.

MATLAB is used for programming purpose. It is also used for simulation in earlier stages.

III. EMG SENSOR DESIGN

EMG acquisition system consists of

- 1) Instrumentation amplifier

- 2) Filter

- 3) Rectifier

- 4) Very low pass filter

- 5) Sample and hold circuit

A) Instrumentation Amplifier:

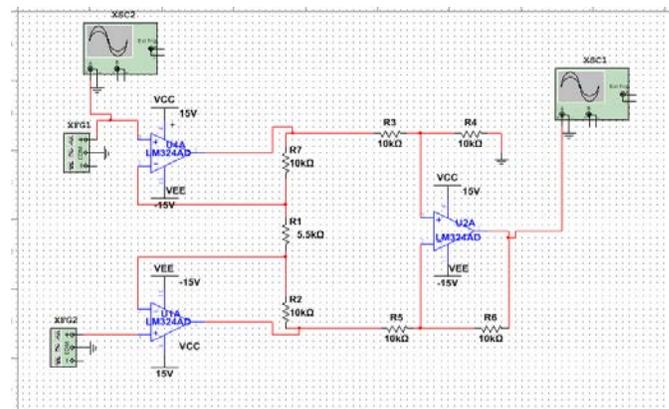


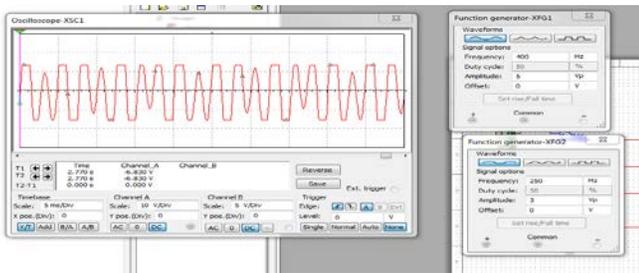
Fig2. Instrumentation amplifier

An instrumentation amplifier is a type of differential amplifier that has been outfitted with input buffer amplifiers, which eliminate the need for input impedance matching and thus make the amplifier particularly suitable for use in measurement and test equipment. Although the instrumentation amplifier is usually shown schematically identical to a standard operational amplifier (op-amp), the electronic instrumentation amp is almost always internally composed of 3 op-amps. These are arranged so that there is one opamp to buffer each input (+,-), and one to produce the desired output with adequate impedance matching for the function.

For EMG sensor design, instrumentation amplifier is used for amplification purpose. The captured muscle is given to two buffer amplifiers then their outputs are given to another opamp. The total construction is called as instrumentation amplifier.

The signals captured from muscle have very low amplitude. These signals need to be amplified for easy analysis.

Components	Rating	Quantity
Resistors	10k	6
	5.5k	1
Opamp	IC 741	3



Signal 2: Amplifier output

B) Filter:

The band pass filter input is the output of the instrumentation amplifier. It's used to eliminate the unwanted frequency component that is outside the typical SEMG signal frequency range 20-500Hz. High-pass filtering is used to remove movement artifacts and DC components and low pass filtering is desirable to remove high frequency content above 500Hz to avoid signal aliasing.

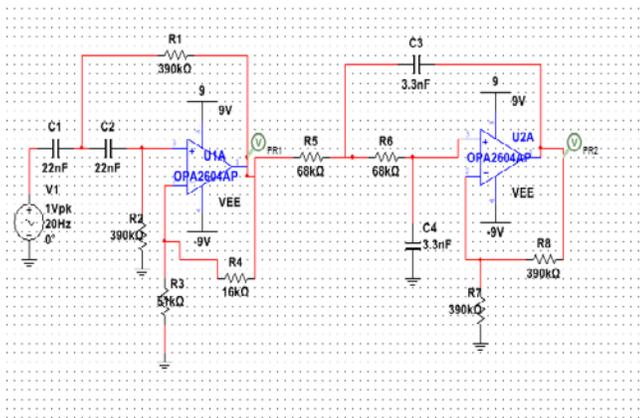
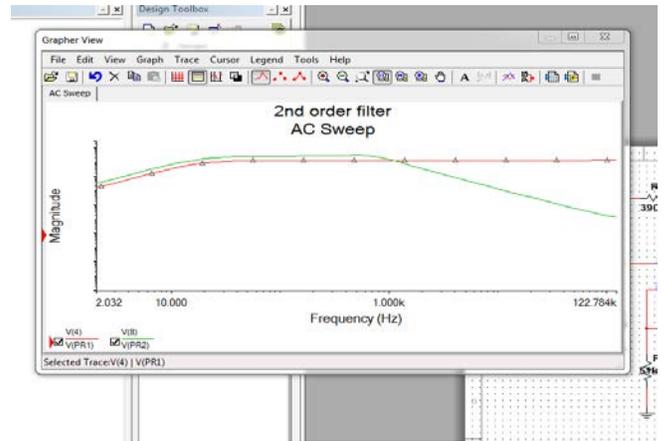


Fig3. Band pass filter

Components	Rating	Quantity
Resistors	390k	4
	51k	1
	16k	1
Capacitors	68nF	2
	22nF	2
	3.3nF	2
Opamp	IC 741	2



Signal 3: band pass filter

C) Rectifier :

Rectifier is used for rectification of filter output. The signal at the output of filter is biphasic, having zero mean value. So the signal needs to be shifted at single side, say positive side of x axis. This function is performed by rectifier.

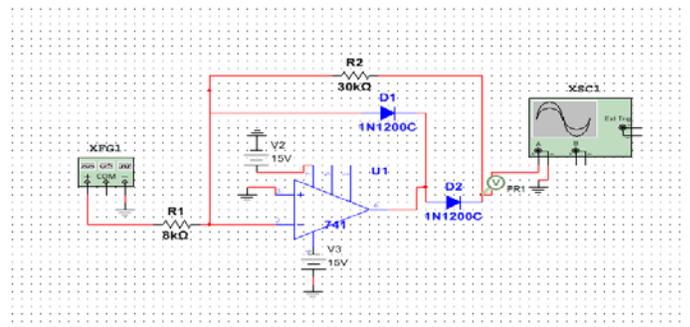
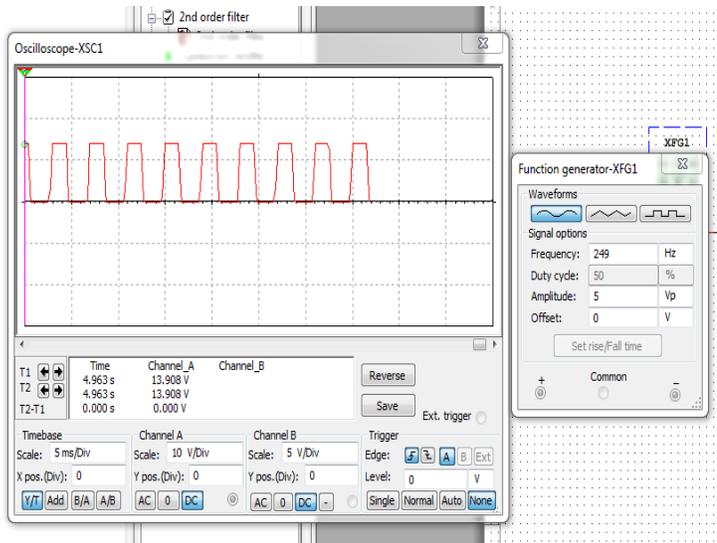


Fig4. Rectifier

Components	Rating	Quantity
Resistor	8k	1
	30k	1
Diode	1N1200C	2
Opamp	IC 741	1



Signal 4: Rectifier output

D) Very low pass filter :

The very low pass filter is used for removal of unwanted signals from the output of rectifier. It is the combination of two low pass filters together called as very low pass filter.

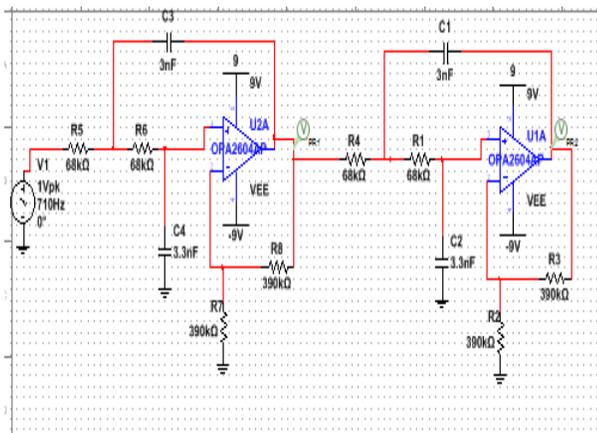
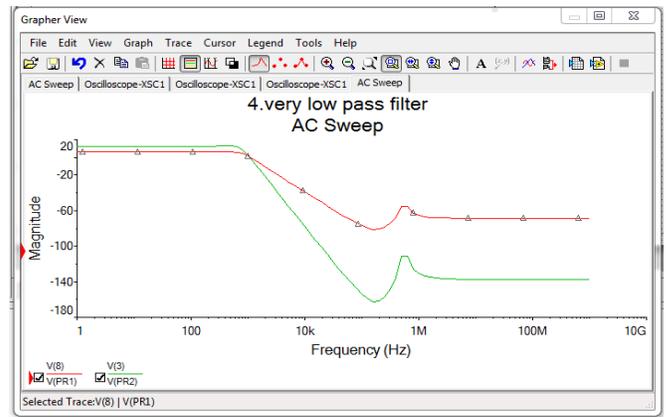


Fig5. Very low pass filter

Components	Rating	Quantity
Resistor	68k	4
	390k	4
capacitor	3nF	2
	3.3nF	2
Opamp	IC 741	2



Signal 5: Very low pass filter

E) Sample and hold circuit :

Sample and hold circuit plays an important role when it comes to sampling and holding the signal. Sampling is nothing but the conversion of continuous time signal to discrete time signal. It holds the circuit for better analysis.

The control wave is provided to sample and hold to decide sampling rate.

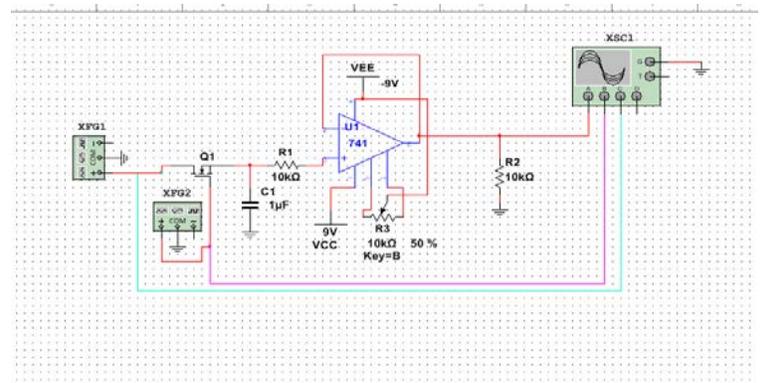
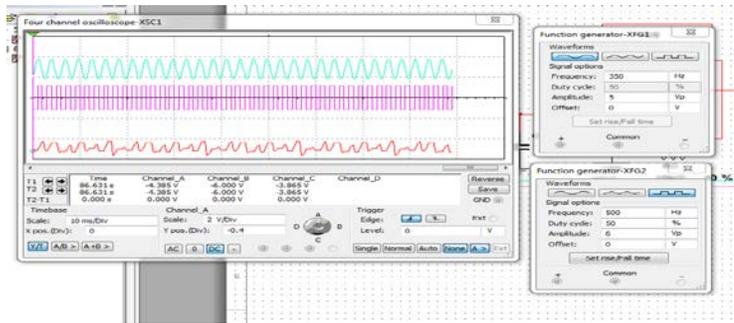


Fig6. Sample and hold circuit

Componen	Rating	Quantit
Resistor	10k	2
Capacitor	1 uF	1
Opamp	IC 741	1



Signal 6: sample and hold output

MATLAB is used for programming the signal taken from arduino. MATLAB performs some operation useful for easy signal analysis such as fft.

MATLAB Code :

```

emg = load('emg_healthy.txt');
figure(1)
plot(emg(:,1), emg(:,2))
xlabel('Time'); ylabel('EMG'); title('EMG SIGNAL'); %EMG
MUSCLE SIGNAL
grid
rec_emg = abs(emg);
figure(2)
plot(rec_emg(:,1), rec_emg(:,2))
xlabel('Time'); ylabel('EMG'); title('Full Wave Rectifier');
%RECTIFICATION
grid
Fs=4000;
pi=3.142;
T=1/Fs;
L=length('emg');
%t=(0:L-1)*T;
Y=fft(emg(:,2));
P2=abs(Y/L);
P1=P2(1:fix(L/2)+1);
P1(2:end-1)=2*pi(2:end-1);
f=Fs*(0:(L/2))/L;
figure(3)
plot(f,P1)
xlabel('Frequency'); ylabel('Intensity');title('FFT of EMG');%FFT
grid
fnqy=Fs/2;
Fc=3;
O=4;
[B,A]=butter(O,Fc*2/Fs,'low');
RMS=filter(B,A,rec_emg);
figure(4)
plot(rec_emg(:,1),rec_emg(:,2),'b') %BUTTERWORTH FILTER
OUTPUT
hold on
plot(emg(:,1),RMS(:,2),'r','linewidth',2)
xlabel('Time'); ylabel('EMG'); title('RAW EMG');
legend('Rectified EMG','RMS EMG') %OUTPUT
    
```

F) Arduino :

Arduino is a user friendly hardware with its own software. It is used for programming purposes. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output(I/O) pins. These pins are used for interfacing external components. The program is loaded in arduino through computer using USB.

Signal captured from arduino is in column form. The signal is then given to MATLAB for further processing. Following code is used for storing data in text file when muscle is stretched.

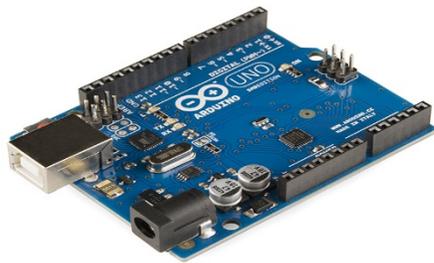


Fig7. Arduino board

Arduino code:

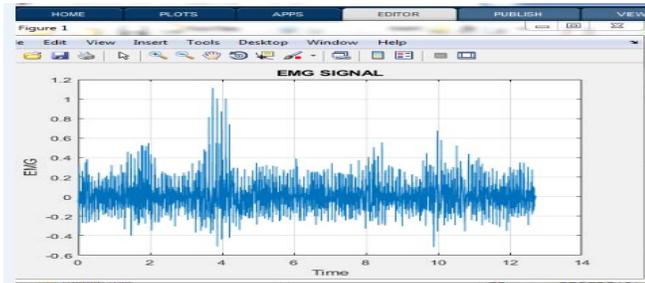
```

//Serial printer for the EMG sensor
//This code is for printing the EMG value on the
//serial monitor.
//
//© Au Robots 8.4.2017

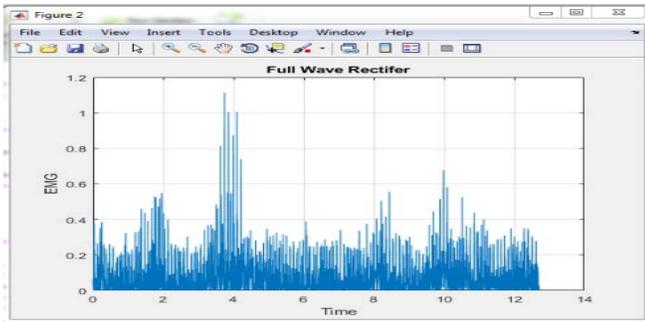
int x;
void setup()
{
Serial.begin(9600);
}

void loop()
{
Serial.println(analogRead(x));
}
    
```

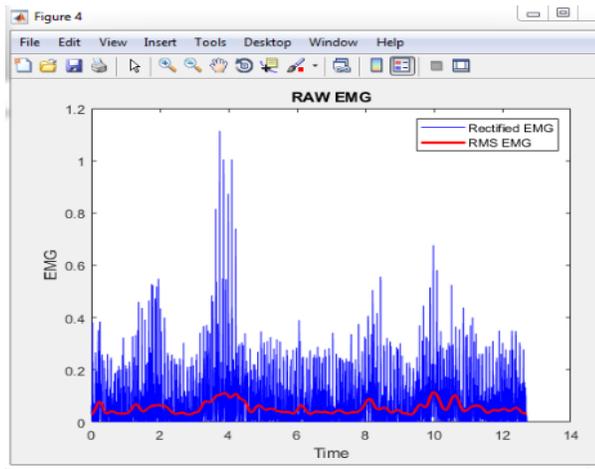
G) MATLAB :



Signal 7: Raw EMG signal

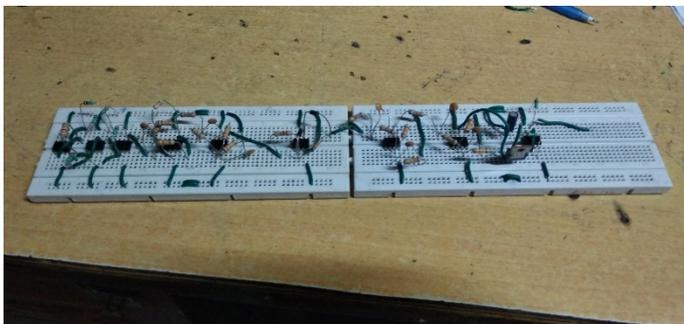


Signal 8: Rectified EMG signal



Signal 9: Filtered and ff transformed EMG

hardware model



IV. CONCLUSIONS

- EMG is crucial for detection of disorders related to muscle.
- It helps doctors to find and cure the disorder.
- EMG can be used for some other applications also like motor controlling , robotic hands ,etc.

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List of signals:

Signal 1	Sample emg
Signal 2	Aamplifier output
Signal 3	Bandpass filter
Signal 4	Rectifier output
Signal 5	Very low pass filter
Signal 6	Sample and hold
Signal 7	Raw EMG
Signal 8	Rectified EMG
Signal 9	Filtered and ff transformed

AUTHORS

First Author – Aniket Bari, Department of electrical engineering, Government College of Engineering, Jalgaon.
aniket2.bari@gmail.com

Design and Implementation of Microcontroller Based Stepper Motor Control System for 3-Axis Airfoil Maker CNC Machine

Thet Yee Mon^{*}, San Hlaing Oo^{**}, Hnin Ei Phyu^{***}
Department of Avionics, Myanmar Aerospace Engineering University

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Abstract- This paper emphasizes design and implementation of 3 Axis Airfoil Maker Machine using Arduino microcontroller based on computerized numerical controller (CNC) machine. In this work, there are two main points that are design and construction of machine and programming the motor control algorithm. The size of machine is portable and desktop version. This machine requires three stepper motors to move X, Y and Z directions according the command instructions from PC based CAM software. When the desired airfoil coordinates are inputted to CAM software, the output G-code are produced and then, this codes are sent to microcontroller by using USB interface. Microcontroller decodes these commands to drive stepper motors. The movement control program is written on C programming. This program will determine how many rotations that cause the distance of the machine movement according to each axis. The main aim of this research is to produce the precision airfoil as a part of wing model which is used to radio controlled (RC) airplane. It eventually reduces time consume and rate of error and also increase the accuracy of shape of airfoil production.

Keywords: CNC Machine, Airfoil, C programming, Microcontroller, CAM software, G-code, Stepper Motor

I. INTRODUCTION

CNC machine is a process used in the manufacturing sector that involves the use of computers to control machine tools. Tools that can be controlled in this manner include lathes, mills, routers and grinders. The CNC stands for Computer Numerical Control. CNC operates on digitized data, a computer. CAM program is used to control, automate, and monitor the movements of a machine. The CNC controller works together with a series of motors and drive components to move and control the machine axes. Open source software is used for executing the G-code for machining applications. The development of such machines can be considerable on a smaller, low-cost scale. A simpler commercial size CNC with Mach 3 software on a desktop PC have been developed, but requiring a parallel port. The PC is interfaced with low-cost embedded microcontrollers through the serial port. The CNC machine designs above rely on the use of stepper motors of limited power in open loop mode. A major new development in computer technology is the availability of low-cost open source hardware, such as the Arduino microcontroller platform. For many reasons, Arduino microcontroller based stepper motor control system has been chosen open source software and optimized for 3-axis airfoil maker CNC machine. Figure 1 shows overall block diagram of 3-axis airfoil maker CNC machine.

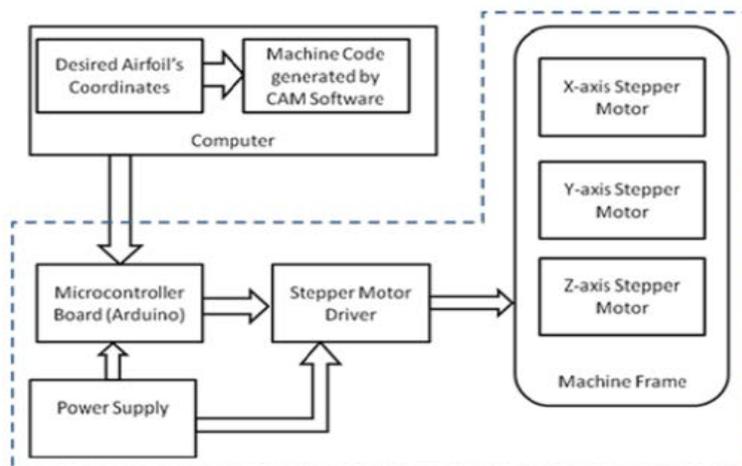


Figure 1. Overall Block Diagram of 3-axis Airfoil Maker CNC Machine

II. METHODOLOGY

A. AIRFOIL NOMENCLATURE

A wing is the combination of airfoil shaped ribs. Lift force produced by wings are depended on the design of airfoil shape .Two other outputs of the airfoil are drag and pitching moment. Figure 2 shows the combinations of airfoils for wing.

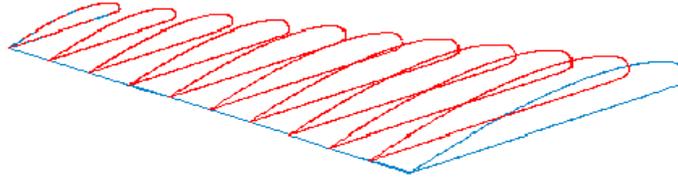


Figure 2. Combination of Airfoils for Wing

As shown in Figure 3, the following parameters are defined in an airfoil.

Chord length: length from the leading edge (LE) to the trailing edge (TE) of a wing cross section that is parallel to the vertical axis of symmetry

Mean camber line: line halfway between the upper and lower surfaces

Camber: maximum distance between the mean camber line and the chord line, measured perpendicular to the chord line

Thickness: distance between upper surface and lower surface measured perpendicular to the mean camber line.

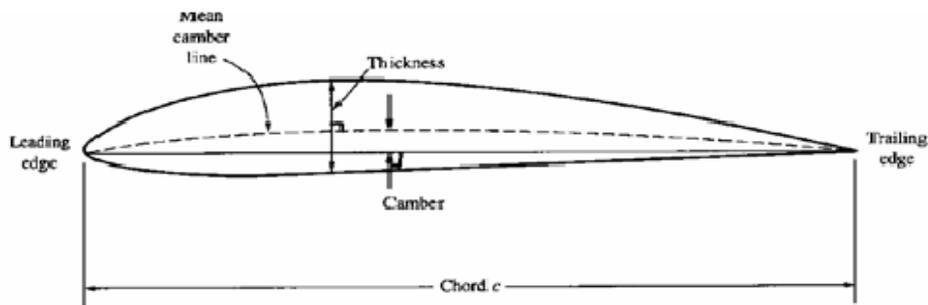


Figure 3. Airfoil Nomenclature

B. Types of Airfoils

There are four different types of airfoil. They are

- (a) Symmetrical Airfoil: It is used for aerobatics airplane, particularly monoplanes.
- (b) Semi-Symmetrical Airfoil: It is used for secondary trainers , sailplanes and sport aerobatic biplanes.
- (c) Flat-Bottom Airfoil: It is used for gentle flight
- (d) Under-Cambered Airfoil: It is used for scale models, sailplanes and some high-lift situations

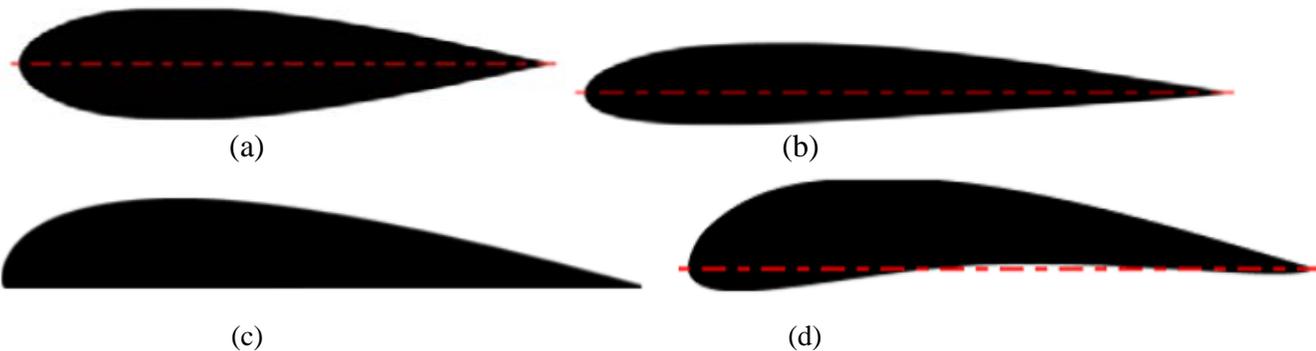


Figure 4. Types of Airfoil: (a) Symmetrical Airfoil, (b) Semi Symmetrical Airfoil, (c) Flat-Bottom Airfoil, (d) Under-Cambered Airfoil

D. Airfoil Selection

In this paper, NACA 1408 (4-digit) Semi-Symmetrical airfoil series is selected. First number is camber in percentage of chord, second number is location of maximum camber in tenths of chord measured from leading edge (LE) last two digits give maximum thickness in percentage of chord.

E. Airfoil Coordinates

Airfoil coordinates are simply points that define the shape of the airfoil. The numbers are given in percentage of the wing chord. The airfoil can be made up from 50 to 100 coordinate pairs. Figure 5 shows the NACA 1408n Airfoil Coordinates and Figure 6 show s the plotting the NACA 1408 Airfoil Coordinates.

X	Y upper	Y lower
1	0.00028	-0.0004027
0.9914866	0.00062857	-0.0004466
0.9662362	0.00167121	-0.000942
0.9251087	0.00330651	-0.0017283
0.8695046	0.00533514	-0.002745
0.8013175	0.00727837	-0.0039473
0.7228695	0.01001957	-0.0052889
0.6368319	0.01226593	-0.006643
0.5461347	0.01420668	-0.0079618
0.4538664	0.01563766	-0.0090424
0.3631692	0.01644857	-0.0098535
0.2771316	0.01633461	-0.0102909
0.1986835	0.01523939	-0.0102157
0.1304965	0.0132667	-0.0095475
0.0748924	0.0106489	-0.0080837
0.0337649	0.00721173	-0.005995
0.0085145	0.00363826	-0.0031349
0	-4.034E-05	-4.034E-05

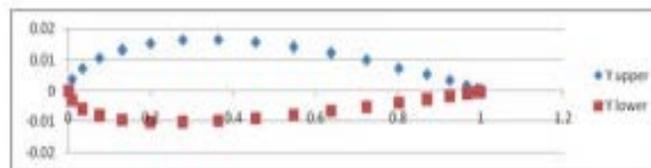


Figure 5. NACA 1408 Airfoil Coordinates

Figure 6. Plotting the NACA 1408 Airfoil Coordinates

F. G-code for NACA 1408 Airfoil

G-Code is the language used to describe how a machine will move to accomplish a given task, using numerical control (NC) - it is the most widely used NC programming language. Figure7 show the g-code for NACA 1408 generated from KCAM software.

```

Feed Rates
Travel [5] IPM Cutting [5] IPM
N001 (KCAM CONVERSION)
N002 (ORIGINAL FILE: NACA1408.DXF)
N003 %
N004 G90
N005 M03
N006 G00 Z1
N007 G00 X100 Y0.004
N008 G00 Z0.5
N009 G01 X95.015999 Y0.630
N010 G01 X90.62993 Y1.271
N011 G01 X80.63994 Y2.305
N012 G01 X70.641 Y3.193
N013 G01 X60.634 Y3.931
N014 G01 X50.61997 Y4.502
N015 G01 X39.99995 Y4.859999
N016 G01 X29.94999 Y4.939
N017 G01 X24.92999 Y4.819
N018 G01 X19.90297 Y4.574
N019 G01 X14.889 Y4.171
N020 G01 X9.88299 Y3.550
N021 G01 X7.206 Y3.130
N022 G01 X4.69299 Y2.602
N023 G01 X2.418 Y1.862
N024 G01 X1.189 Y1.324
N025 G01 X0 Y0
N026 G01 X1.211 Y-1.2
N027 G01 X2.582 Y-1.62
N028 G01 X5.104 Y-2.124
N029 G01 X7.614 Y-2.499
N030 G01 X10.117 Y-2.662
N031 G01 X15.10999 Y-2.952
    
```

Figure 7. G-code for NACA 1408 generated from KCAM software

G. System-Elements

In the control circuit for 3-axis airfoil maker CNC machine, it consists of microcontroller (Arduino ATmega 2560), easy driver circuit, L298N driver circuit and NEMA 17 stepper motors. The arduino is an open source electronics prototyping platform based on flexible, easy to use hardware and software. Arduino is best known for its hardware, but it is also needed software to developed program required for that hardware. The software is free, open source and cross platform. For this research, it is use Arduino MEGA microcontroller board based on ATmega2560 is used because it board has many digital output pin and storage memory than other Arduino board. Stepper motor have bipolar and unipolar stepper motor. Bipolar stepper motor is better holding torque than unipolar stepper motor. NEMA 17 stepper motor is bipolar. NEMA 17 is common size used in 3D printers and smaller CNC mills. Smaller motors find applications in many robotic and animatronic applications. NEMA 17 stepper motor has maximum torque at low speed , good choice for application requiring low speed with high precision. Easy driver circuit is used to drive stepper motor. Easy driver can drive up to about 720mA per phase of a bipolar stepper motor. It defaults to 8 steps microstepping mode. It is a chopper micro stepping driver based on the Allegro A3967 driver chip. It can take a maximum motor driver voltage of around 30V and includes on board 5V regulation. Figure 10 show the easy driver circuit. L298N driver circuit can be drive inductive loads such as relays, solenoids, dc and bipolar stepping motor. This circuit offers a bridged mode of operation allowing bidirectional control of a single motor of up to about 4A.

III.DESIGN CONSIDERATION AND EEPERIMENTAL RESULTS

A. Designed and Construction of Control Circuit Board of Stepper Motor Control System

In this research , Arduino Microcontroller platform with Atmega2560 core is used. It can be easily interfaced with PC where, as also with the motor drivers(Easy and L298N) and stepper motors too. Figure 8 shows circuit connection of 3-axis airfoil maker CNC machine.

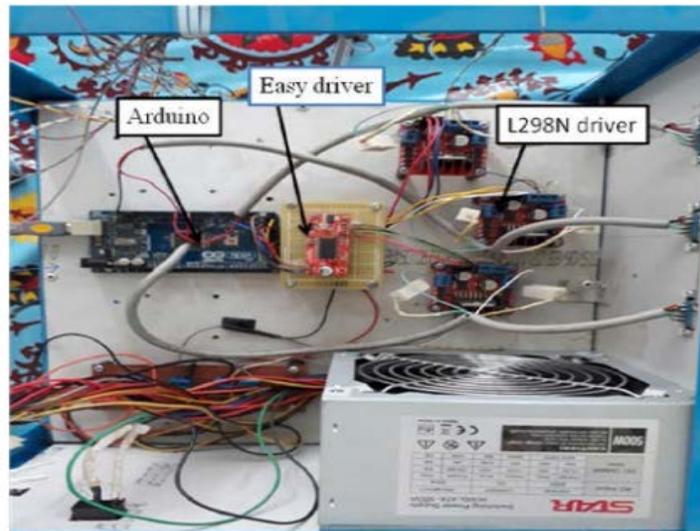


Figure 8. Circuit Connection of 3 –Axis Airfoil Maker CNC Machine

In this circuit, it is designed for needing Ampere(A).

For One Stepper Motor : 3.3V , 1.5A

Required for 12V Stepper Motor : 12V , 5.45A

Easy Driver Load Current : 1.5A

L298 Driver Load Current : 4 A

Total Easy and L298 Driver Load Current : 5.5 A

B. Hardware Machine Frame Requirements

The machine frame is designed and constructed as the following desired parameters shown in Table 1. Figure 9 shows the machine frame.

TABLE 1: Machine Frame Requirement

No:	Components of machine frame	Desired Length/number
1	3/4"GI square pipe	19 feet
2	1/2" GI square pipe	10 feet
3	6000 2RS-Ball bearing	26 Nos

4	L-bean	3 feet
5	14mm bolt and nuts	38 Nos
6	screw	12 Nos
7	3mm bolt and nuts	24 Nos
8	1/2" ACME thread rod	4.5 feet
9	1/2" nut	3 Nos
10	2" x 1" wood	1 feet 7 inches
11	1' x 1.5" wood board	1 Nos
12	12" slide ray	1 Nos
13	rivet	8 Nos



Figure 9. Machine Frame

Figure 10 shows the final assembly of machine frame, stepper motor and motor control circuit.



Figure 10. Final Assembly Of Machine Frame, Stepper Motor And Motor Control Circuit

C. Software Implementation

Figure 11 shows the flow chart of application execution. At start, power supply and computer is turned on. After that all stepper motor are initialized to its zero position. This zero position is given through software. The circuit board is ready to accept instructions from computer. These instructions are in the form of G-codes. It will wait still instructions to be received. After instructions are received, it starts to decode it into its own language that is in the voltage and current form. As per instruction, stepper motor move in accordance with it. The stepper motor moves according to X-Y Co-ordinates and Z Co-ordinate stepper motor is used to drill the hole. When task is completed, it is the end of the flow of execution.

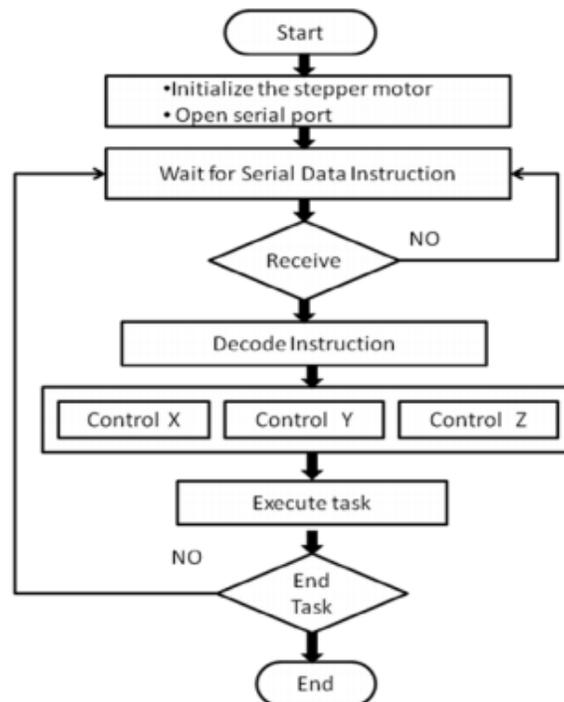


Figure 11. Flow Chart of Stepper Motor Control System

D. Arduino Program for Motor Control System

As the first step, the Arduino C program to develop source code compiled using Arduino software. After the software is compiled, it is upload to the control board. This program drives bipolar stepper motor. The motor is attached to digital pin 8 to 11 of the Arduino. The motor should revolve one revolution in one direction, then one revolution in the other direction. The motor will step one step at a time, very slowly. The higher the potentiometer value, the faster the motor speed. The motor is less responsive to changes in the sensor value at low speeds. Figure 12 shows the motor control program on Arduino and Figure 13 shows the experimental testing of the three stepper motors with motor control program.

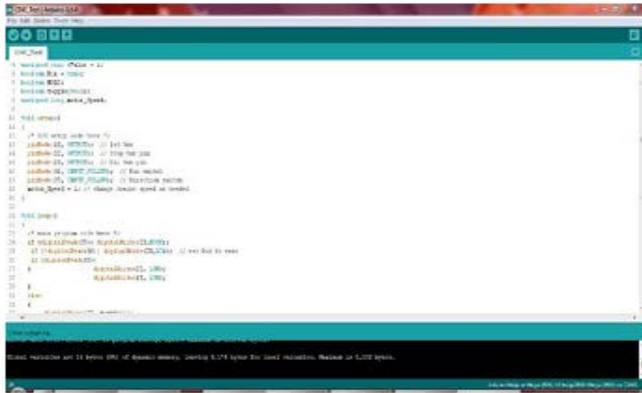


Figure 12. Motor Control Program on Arduino



Figure 13. Experimental Testing of the three Stepper Motors

E. Generation of G-code Required for Airfoil Coordinates

This is used to send the G-code files (.NC) to an integrated hardware interpreter (ATmega2560). This software will take a G-code program in file and send it line-by-line to the ATmega 2560 microcontroller. The G codes will send over the serial ports through USB communication between the computer and microcontroller. KCAM software is a type of software designed to send G-Code to CNC machines. Figure 14 shows the using KCAM software for airfoil coordinates and G code.

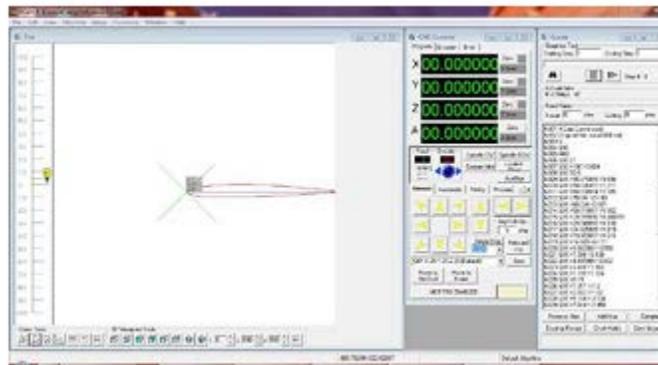


Figure 14. Using KCAM Software for Airfol Coordinates and G-code

F. Experimental Results

According to X-Y axis co-ordinate position the CNC Router will be moved and whenever it stops then starts the operation of Z axis. Z axis performs Up-down operation for milling purpose. Figure 15 shows the final results product of NACA 1408 Airfoil Model.



Figure 15 . Final Product of NACA 1408 Airfoil Model

IV CONCLUSIONS

Using small machine tools to fabricate small scale parts can provide both flexibility and efficiency in manufacturing approaches and reduce capital cost, which is beneficial for small business. In this research paper, Arduino based 3-axis

airfoil maker CNC machine is designed and implemented under very limited budget. From this research, a machine can be achieved which has high accuracy and low cost as compared to large CNC machine. The type of workpiece has to choose wood as a sample for airfoil. The running time for this wood is expected in approximately 10minutes. Airfoil operated by Arduino based control system has been produced as the correct plotting coordinates for NACA 1408 airfoil model.

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AUTHORS

First Author – Thet Yee Mon, Lecturer, Department of Avionics, Myanmar Aerospace Engineering University, thetyemon@gmail.com

Second Author – San Hlaing Oo, Professor, Department of Avionics, Myanmar Aerospace Engineering University,sanhlaingoo1981@gmail.com

Third Author – Hnin Ei Phyu, Lecture,Department of Avionics , Myanmar Aerospace Engineering University, hnin111@gmail.com

Microbial Quality of Avocado and Guava Fruits used for Preparation of Freshly Squeezed Juices from Juice Houses of Bahir Dar Town, Northwest Ethiopia.

Muchie Shiferaw*, Mulugeta Kibret**

*Amhara National Regional State Industry Development Bureau, Bahir Dar, P.O Box 49, Ethiopia.
** Bahir Dar University, College of Science, Department of Biology, Bahir Dar, P.O Box 79, Ethiopia
*muchie.sh09@gmail.com
**mulugetanig@gmail.com

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ABSTRACT

The objective of this study was to assess the microbial quality of fruits used for preparation of juices from juice houses of Bahir Dar town, Ethiopia. The mean aerobic mesophilic counts from avocado surface, avocado peel, guava surface and guava peel were 5.24, 4.88, 4.98 and 4.35log10cfu/g, respectively. The mean total coliform counts from avocado surface was 272.08, avocado peel 67.31, guava surface 183.80 and guava peel 46.63MPN/g. Similarly, the mean fecal coliform counts were 59.45, 21.87, 48.77 and 19.51MPN/g from avocado surface, avocado peel, guava surface and guava peel, in that order. The mean *S. aureus* counts were also 4.91, 3.94, 2.91 and 1.74log10cfu/g on avocado surface, avocado peel, surface of guava and its peel, correspondingly. Finally, the mean yeast and mold counts were 3.50, 2.95, 2.39 and 1.85log10cfu/g from avocado surface, avocado peel, guava surface and guava peel, respectively. The mean microbial counts of avocado fruits were higher than guava fruits and the fruit surfaces were higher than fruit peels as well. Moreover, 12 (15%) *Salmonella* and 5 (6.25%) *Shigella* spp. were also isolated from both surface and peel of fruits. In almost all juice houses, lack of awareness and poor sanitary conditions promote the probability of fruit contamination. Therefore, keeping the sanitary conditions of juice houses and providing regular training for fruit handlers are some of the practices to improve microbial quality, safety and shelf-life of fruits and their products.

Key words: Avocado, guava, hygienic conditions, juice houses, microbial quality.

1. INTRODUCTION

Fruits are exceptional dietary source of nutrients and fiber for human beings hence vital for good health and fitness [1]. Regular consumption of well balanced foods, rich in fruits are especially valuable for their ability to prevent deficiencies of different vitamins, particularly vitamin A and vitamin C and also reduce the risk of several diseases like breast cancer, congestive heart failure (CHF), stroke, Alzheimer disease, cataracts, urinary tract infection (UTI) and also improve blood lipid profiles in peoples affected by hyper-cholesterolemia [2]. Hence, fruit safety has emerged as an important global issue with international food and public health implication. In response to the increasing of foodborne illness, health and other concerned organizations are intensifying their effort to improve fruit safety [3].

Avocado (*Persea americana*) and guava (*Psidium guajava*) fruits are largely consumed in raw, without further processing in most parts of Ethiopia. They are sold under poor hygienic conditions in the market, juice houses, roadsides and hawkers with excess flies and dusts all over the fruits. These can certainly increase the chance of microbial contaminations. Thus, the presence of these microorganisms on these fruits is dangerous for human consumption [4, 5].

*Corresponding author. Tele (+251)918702656
E-mail address: muchie.sh09@gmail.com
<http://dx.doi.org/10.29322/IJSRP.8.9.2018.p8115>

In Ethiopia, particularly in Bahir Dar town there is no information about the microbial quality of fruits that used for preparation of juices and no continuous assessment of fruit safety has been developed in the juice houses of the town. In addition, sanitation practices of juice houses, hygienic conditions of fruit storages and handling practices of fruits are poor. These factors may affect the microbial quality and safety of fruits and their products which cause a serious health risks to the consumers. Therefore, this study was undertaken to evaluate the microbial quality of avocado and guava fruits used for preparation of freshly squeezed juices from juice houses of the town.

2. MATERIALS AND METHODS

2.1 Sampling Techniques

A cross-sectional study was carried out on a total of 80 (40 avocado and 40 guava) fresh fruit samples, five of each from eight purposively selected juice houses of Bahir Dar town were taken from December 2014 to April 2015 for microbiological analysis. From each selected sample juice houses, one kilogram of each of avocado and guava fruits were purchased on the receipt by considering the effect of time and temperature; each of the fruits were decanted into two separated polythene bags. The collected samples were then transported to Microbiology Laboratory in the icebox and then fruit samples were analyzed within an hour of procurement. From the samples, physically damaged and spoiled fruits were excluded in the study. Additional information on risk factors of sanitary conditions and handling practices of fruits were also taken from selected sample juice houses by checklist at the same time.

2.2 Sample Preparation for Microbial Analysis

Microbiological analysis was done for both surface and inside of avocado and guava fruits by using one sample for each surface and inside analysis by dividing in to two portions and weighing 25gm for each fruit samples and homogenized in 225ml of sterile peptone water separately for fruit surface (wash) parts for about three minutes. The washed fruit samples were then removed aseptically and crushed properly by sterile mortar and pestles separately. The crushed samples were again homogenized in another flask containing 225ml of peptone water for fruit peel including the inside parts. From each homogenized samples, one ml homogenates were transferred to each test tubes containing 9ml of sterilized saline solutions to prepare each of the ten-fold serial dilutions (10^{-2} to 10^{-5}). The homogenates were used for enumeration of quality indicators (AMC, TCC, FCC, and *S. aureus* counts), microbial spoilage (yeast and mold) counts and isolations of pathogens (*Salmonella* and *Shigella*) spp. by standard procedures on appropriate culture media from both surface and peel parts of each fruit samples [6, 7]. The results of microbial analysis were also compared with microbiological criteria set for ready-to-eat foods [8, 9].

2.2.1 Aerobic Mesophilic Counts (AMC)

The aerobic mesophilic count was determined by pour plate method using pour plate count agar. One ml from each last serially diluted samples (10^{-3} , 10^{-4} and 10^{-5}) were taken aseptically and pour plated into three sterilized triplicate leveled plates then poured the sterile plate count agar (PCA) (Don Whitley ltd, India) on the samples. Then the plates were incubated in inverted position at 37°C for 24 hours under aerobic atmosphere. After incubation plates with colonies between 30 and 300 were counted using Stuart colony counter (UK) and the result was reported as cfu/g of samples [8, 10].

2.2.2 Enumeration of Coliforms,

Total Coliform Counts (TCC)

This test was employed by using Lauryl SulphateTryptose broth (LSTB) (HiMedia ltd, India) for presumptive test and Brilliant Green Lactose Bile Broth (BGLBB) for confirmatory tests. From each last three ten-fold serial dilutions (10^{-3} , 10^{-4} and 10^{-5}), one

ml of each sample was transferred in to triplicate tubes containing (LSTB) with inverted Durham's tube. Then the samples were incubated at 37°C for 24 hours. Tubes with acid and gas formations at the end of incubation periods were selected as presumptively positive for total coliform tests. A loop full of inoculum from each presumptive positive tubes were inoculated in to other tubes containing 10ml of (BGLBB) (HiMedia ltd, India) with inverted Durham's tubes for confirmatory test. Then tubes were incubated again at 37°C for 24 hours. As the result of incubation, those tubes which form gas were considered for total coliform confirmation and evaluated according to the MPN table and reported as MPN/g of sample [8, 11].

Fecal Coliform Count (FCC)

Enumeration of fecal coliform was also determined by using the most probable number (MPN) method and LSTB (HiMedia ltd, India) for presumptive test like that of total coliform and other procedures were also similar to that of total coliform counts. The difference is temperature of incubation that is 44.5°C and MacConkey broth (Blulux ltd, India) was used here for confirmatory test instead of BGLBB. Examined for gas production at 24 hours; if the result was negative, examine again at 48 hours. Results of a test were reported as MPN/g of sample [8].

2.2.3 Enumeration of *Staphylococcus aureus*

Staphylococcus aureus was enumerated by using pour plate method and Manitol Salt agar (MSA) (Oxoid, England). One ml of samples from each last three ten-fold serially diluted solutions (10^{-3} , 10^{-4} and 10^{-5}) were aseptically taken and poured in to triplicate leveled plates and MSA was poured on the samples. Then the plates were incubated in inverted positions at 37°C for a maximum of 48 hours for the growth of yellow colonies due to manitol fermentation. The mean number of *S. aureus* per gram of each fruit samples was counted as of aerobic mesophilic bacterial counts but in this case plates with 20 to 200 colonies were selected and numbers of colonies were reported as cfu/g of sample [6, 12].

2.2.4 Enumeration of Yeast and Molds

Enumeration of yeast and mold was determined by using Potato Dextrose agar (Blulux ltd, India) in the presence of 10% tartaric acid. Here surface spread-plate technique was used rather than pour plate techniques. This technique provides maximal exposure of the cells to atmospheric oxygen and avoids heat stress from molten agar [7]. The molten PDA was transferred in to empty sterilized triplicate plates and allowed to solidify with 10% tartaric acid. Each 0.1 ml of the homogenized samples from each three ten-fold serially diluted solutions (10^{-2} , 10^{-3} and 10^{-4}) were aseptically taken and spread on the surface of solidified PDA by sterile bent glass rod. Then the plates were incubated in an upright position at 21-25°C for about 5-7 days in dark. After incubation colonies between 10 and 150 were counted by using Stuart colony counter (UK). Yeast and mold colonies were identified morphologically by their white creamy and fuzzy colors respectively. The results were reported in the form of cfu/g of sample [6, 7].

2.2.5 Isolation and Characterization of *Salmonella* and *Shigella* spp.

*Corresponding author. Tele (+251)918702656
E-mail address: muchie.sh09@gmail.com
<http://dx.doi.org/10.29322/IJSRP.8.9.2018.p8115>

In the fruit samples, *Salmonella* and *Shigella* spp. may be present in low numbers in addition to other microorganisms, and they may be injured. To diminish the risk of obtaining false negative results, pre-enrichment (peptone water) and selective enrichment (Selenite Cysteine broth) were used. The homogenized samples from surface and peel of each fruits were incubated at 37°C for 24 hours for pre-enrichment. From each pre-enriched samples, one ml was transferred in to tubes containing 10 ml of Selenite Cysteine broth (HiMedia Ltd, India) and thoroughly mixed for two minutes. Following mixing up, tubes were incubated at 37°C for 24 hours [6, 8].

A loop-full of inoculum was aseptically taken from each incubated Selenite Cysteine broth and streaked onto Xylose Lysine Deoxycholate agar (XLD) (Oxoid, England) for *Salmonella* and *Shigella* spp. MacConkey agar (Oxoid, England) was also used additionally for *Shigella*, which were then incubated at 37°C for 24 hours. Morphologically, pink colonies with or without black centers were assumed to be presumptive *Salmonella* and red or pink colonies were assumed to be presumptive *Shigella* on XLD agar but on MacConkey agar smooth colorless, opaque or transparent colonies were also assumed to be presumptive *Shigella* [8, 13]. The presumptive colonies from XLD agar were aseptically picked and streaked on to nutrient agar (Don Whitley, India) for purification purpose and incubated at 37°C for 24 hours. Pure colonies were also transferred aseptically in to Tryptic Soya agar (TSA) (Don Whitley Ltd, India) slants as stock cultures and stored in refrigerator at 4-5°C. The pure cultures were then subjected to biochemical tests like Citrate utilization test, Motility test, Indole test, Lactose fermentation and H₂S production test, Lysine Iron agar test and Urea hydrolysis test [6, 7, 13].

2.3 Data Analysis

All the data were analyzed with SPSS version 20.0 for Windows software. The significance between the values was evaluated at 95% confidence level. Statistical significance was set at $P < 0.05$. The significance of any observed differences was determined using Chi-square (X^2) test and one-way ANOVA was also used to determine microbial mean differences of samples at each juice houses. The results obtained for cfu/gm of juices were transformed into log values.

3. RESULTS AND DISCUSSION

3.1 Microbiological Analysis of Fruit Samples

As shown in Table 3, the overall range of aerobic mesophilic bacteria was 3.11 to 5.57log₁₀ cfu/g with the mean value of 4.86log₁₀cfu/g in both avocado and guava fruits including their peel. There were statistically significant differences between the mean AMC of avocado fruit surface and avocado fruit peel ($p = 0.00$) and between guava fruit surface and guava fruit peel as well ($p = 0.00$). The difference might be due to the surface part of fruits are exposed to dusts, human and animal contacts, flies and dusts that can contribute to such bacterial loads. The mean AMC of both fruit types vary due to low pH value in guava fruit (3.5-4.5) than avocado fruit (6.3-6.6) which inhibits the growth of bacteria^[14] and surface nature of fruits, avocado fruit has rough surface than guava fruit that harbors high bacterial load. However, there was no statistically significant difference between the mean aerobic mesophilic bacterial count of avocado and guava fruit surfaces ($p = 0.05$).

The present study demonstrated that the overall total coliform counts present in both fruits ranged from 7.30 to 1100MPN/g with mean value of (142.45MPN/g) (Table 3). From these results the higher mean total coliform count was found on avocado fruit surfaces (272.08MPN/g) and the lower mean total coliform count was found in guava fruit peel (46.63MPN/g).

There were statistically significance differences in total coliform counts between avocado fruit surface and avocado fruit peel ($p = 0.00$) and guava fruit surface and guava fruit peel as well ($p = 0.04$). The difference might be due to the exposure of the outer

*Corresponding author. Tele (+251)918702656
E-mail address: muchie.sh09@gmail.com
<http://dx.doi.org/10.29322/IJSRP.8.9.2018.p8115>

surfaces of fruits to various contacts; frequently visited by flies, and airborne dusts which can be major causes of cross-contaminations. The common practice of using poor quality water to wash fruits and the same holding materials could also be responsible for the difference in bacterial loads on both fruit surfaces [15]. However there was no statistically significant variation in total coliform counts between the two fruit types ($p=0.31$).

In the case of fecal coliform enumeration, the overall counts found in both fruits ranged from 3 to 210MPN/g with mean value of 37.40MPN/g. The higher mean value of fecal coliform count was found on avocado fruit surface (59.45MPN/g) and the lower mean value of fecal coliform was found in guava fruit peel (19.51MPN/g) (Table 3). There were statistical significance differences in fecal coliform counts between avocado fruit surfaces and their peel ($p= 0.00$) and guava fruit surfaces and their peel as well ($p= 0.01$).

The difference might be due to the surface parts of fruits exposed to contacts to human with unwashed hands, flies, airborne dusts and physical damages. The presence of coliform bacteria, especially fecal coliform also indicated that fecal contamination of fruits which may be contributed from different sources such as the water used for irrigation during pre-harvest and postharvest activities, improper storage conditions and poor handling practice at any stage could be responsible for the difference in bacterial loads on the fruit surface [15]. However there was no statistically significant difference in fecal coliform counts between the two fruit types (avocado and guava) ($p= 0.66$).

Fecal coliform contamination of fresh fruits and vegetables may be due to pre-harvest factors such as irrigation water, animal manure and effluent of wastes and/or postharvest factors like washing water, handling equipments, storage environment, contact with unwashed hands and transportation vehicles [16]. The presence of coliforms in foods including edible fruits is an indicative of recent fecal contamination and there is a greater risk that pathogens may also be present. So, more attention must be given to careful handling practices and sanitary conditions from cultivation to marketing or consumption processes to prevent such contaminations [17].

The overall *S. aureus* counts in both fruits including their peel ranged from 0 to 5.26log10cfu/g with the mean value of 3.38log10cfu/g. But higher *S. aureus* mean count was found in avocado fruits and lower *S. aureus* mean count was found in guava fruits (Table 3). There were statistically significant differences between avocado fruit surface and avocado fruit peel ($p= 0.00$), guava fruit surface and guava fruit peel ($p= 0.00$) and between avocado and guava fruit surfaces as well ($p= 0.00$).

The differences might be most surface parts of fruits are exposed to human contact during picking for preparation and/or marketing, sorting to get healthy fruits, contact to dusts, frequently visited by flies and exposed to damages that can contribute to bacterial loads. The presence of lower pH in guava fruits (3.5-4.5) can also inhibit microbial growth on their parts [14]. The rough surface natures of avocado fruit also harbor high microbial loads and have great contribution for these differences. The pH value of avocado is almost neutral (6.3-6.6) which is favorable for microbial growth and increases the *S. aureus* count on both parts of the fruits. This was also supported by other works [18]. The presence of *S. aureus* in this study indicated that the poor personal hygienic practice and related factors such as fruit handlers do not use glove, hair cover and overcoat to avoid contacts between body parts. Fruit buyers also touched by their hands for sorting healthy fruits during marketing. These and other related factors have significant contributions for cross-contamination of fruits [19].

From the total of fruit samples, 58 (72.5%) were contaminated by *S. aureus*. Out of this almost all 39 (97.5%) of avocado fruit surface, 24 (60%) of avocado peel and only 6 (15%) of guava fruit surface were potentially hazardous based on [11]. While the

*Corresponding author. Tele (+251)918702656
E-mail address: muchie.sh09@gmail.com
<http://dx.doi.org/10.29322/IJSRP.8.9.2018.p8115>

remaining of fruit samples fell into satisfactory level in which, only 1 (2.5%) of avocado fruit surface categorized as good; 1 (2.5%), 3 (7.5%) and 12 (30%) of avocado fruit peel categorized as good, acceptable and unsatisfactory, respectively. In case of guava fruit surface, 7 (17.5%), 2 (5%) and 25 (62.5%) categorized as good, acceptable and unsatisfactory, respectively. Similarly 13 (32.5%) and 27 (67.5%) of guava fruit peel categorized as good and acceptable, respectively. (Table 1)

Table 1: Number and percentage of NSWFA standard categories of *S. auerus* count on surface and in peel of fruits in juice houses of Bahir Dar town, 2015.

Types of fruits	NSWFA Standard Categories				Total
	Good no (%)	Acceptable no (%)	Unsatisfactory no (%)	Potentially hazardous no (%)	
Avocado surface	1 (2.5)	0	0	39 (97.5)	40
Avocado peel	1 (2.5)	3 (7.5)	12 (30)	24 (60)	40
Guava surface	7 (17.5)	2 (5)	25 (62.5)	6 (15)	40
Guava peel	13 (32.5)	27 (67.5)	0	0	40

In this study, the total yeast and mold counts ranged from 0 to 5.04log10cfu/g with mean value of 2.67log10cfu/g in both fruit samples. Among the fruit samples lower and higher mean yeast and mold counts were found from guava fruit peel (1.85log10cfu/g) and avocado fruit surface (3.50log10cfu/g), respectively. There was also a significant difference in yeast and mold mean counts between avocado fruit surfaces and their peel (p = 0.02) and between guava fruit surfaces and their peel (p= 0.02).

The probable reasons for the discrepancy might be the presence of different variables among the fruits and juice houses that contribute for the differences. In most juice houses fruits were stored in an opened shelf without any covering materials; open display of fruits attracts the customers but encourages sporadic visits by flies [20]. The dusty, unhygienic storage environments coupled with the poor handling, storage conditions, distribution, marketing practices and transportation are factors contributing to the high microbial load including yeast and mold. Moisturized or cooler storage of fruits and deteriorated surfaces of fruits are also known to be the major pre-disposing factors of fruits to microbial attack both in transit and in storage [21, 22]. The common practice of using the same bucket of water to wash all the fruits and the use of the same holding materials (cross-contamination) could also be responsible for the microbial loads [23].

From the total of fruit samples, almost half 38 (47.5%) of the samples found to be contaminated by yeast and mold counts and the remaining 42 (52.5%) of the fruit samples were free from yeast and mold counts. Out of the contaminated fruit samples, 30 (75%) of avocado fruit surface, 18 (45%) of avocado peel, 30 (75%) of guava fruit surface and 5 (12.5%) of guava fruit peel samples have mean yeast and mold counts and categorized as unsatisfactory. While the remaining fruit samples fell into the maximum count permitted level in which only 10 (25%) of avocado fruit surface had mean yeast and mold counts and categorized as minimum count anticipated; 11 (27.5%) and 11 (27.5%) of avocado fruit peel categorized as minimum count anticipated and maximum count permitted level respectively. But in case of guava fruit sample, only 10 (25%) of guava fruit surface had mean

 *Corresponding author. Tele (+251)918702656
 E-mail address: muchie.sh09@gmail.com
<http://dx.doi.org/10.29322/IJSRP.8.9.2018.p8115>

yeast and mold counts and categorized as minimum count anticipated; 18 (45%) and 17 (42.5%) of guava fruit peel had mean yeast and mold counts categorized as minimum count anticipated and maximum count permitted level as well [9] (Table 2).

Table 2: Number and percentage of Gulf standard category levels of yeast and mold counts on the surface and in the peel of fruits in juice houses of Bahir Dar town, 2015.

Types of sample	Gulf Standard Categories			Total
	Minimum count anticipated no (%)	Maximum count permitted no (%)	Unsatisfactory no (%)	
Avocado surface	10 (25)		30 (75)	40
Avocado peel	11 (27.5)	11 (27.5)	18 (45)	40
Guava surface	10 (25)		30 (75)	40
Guava peel	18 (45)	17 (42.5)	5 (12.5)	40

Table 3: Mean and ranges of Microbial counts (log cfu/gm and MPN/gm) on the surface and in the peel of fruits collected from juice houses of Bahir Dar town, 2015.

Enumerated Microbes	Parameters	Sample types and Microbial Counts (log cfu/gm)			
		Avocado Fruit Surface	Avocado Fruit Peel	Guava Fruit Surface	Guava Fruit Peel
	No. of Samples	40	40	40	40
AMC	Mean ± SD	5.24 ± 0.17	4.88 ± 0.45	4.98 ± 0.36	4.35 ± 0.63
	Range	4.32-5.57	4.11-5.24	4.16-5.35	3.11-5.17
	<i>P - Value</i>		0.00		0.00
TCC	Mean ± SD	272.08 ± 371.40	67.31 ± 88.45	183.80 ± 245.09	46.63 ± 38.07
	Range	15-1100	7.30-460	14-1100	9.10-150
	<i>P - Value</i>		0.00		0.04
FCC	Mean ± SD	59.45 ± 61.12	21.87 ± 22.72	48.77 ± 47.43	19.51 ± 20.60
	Range	11-210	3.60-93	6.10-150	3-93
	<i>P - Value</i>		0.00		0.01
SAC	Mean ± SD	4.91 ± 0.84	3.94 ± 0.83	2.91 ± 1.46	1.74 ± 1.28
	Range	0 - 5.26	0 - 4.99	0 - 4.99	0 - 2.99
	<i>P - Value</i>		0.00		0.00
YMC	Mean ± SD	3.50 ± 2.07	2.39 ± 1.56	2.95 ± 1.78	1.85 ± 1.28
	Range	0 - 5.04	0 - 3.86	0 - 4.82	0 - 3.89
	<i>P - Value</i>		0.02		0.02

*AMC: Aerobic Mesophilic Count; *TCC: Total Coliform Count; *FCC: Fecal Coliform Count;

*SAC: *Staphylococcus aureus* Count and *YMC: Yeast and Mold Count.

*SD: Standard Deviation.

3.2 Isolation and Characterization of *Salmonella* and *Shigella* spp.

In the study *Salmonella* spp. were isolated in 12 (15%) fruit samples containing both of the fruit sample types including their peel; of which 5 (12.5%) avocado fruit surface, 2 (5%) avocado fruit peel, 4 (10%) guava fruit surface and 1 (2.5%) guava fruit peel.

Shigella spp. were also isolated from 5 (6.3%) in both of the fruit sample types except guava fruit peel; of which 3 (7.5%) avocado fruit surface, 1 (2.5%) avocado fruit peel and 1 (5%) from guava fruit surface. The maximum and minimum number of contaminated fruit samples by the two pathogens were identified from juice house 01 (JH01) and 05 (JH05) (5 each) followed by juice house 03, 07 and 08 (2 samples each) and juice house 06 (1 sample), respectively.

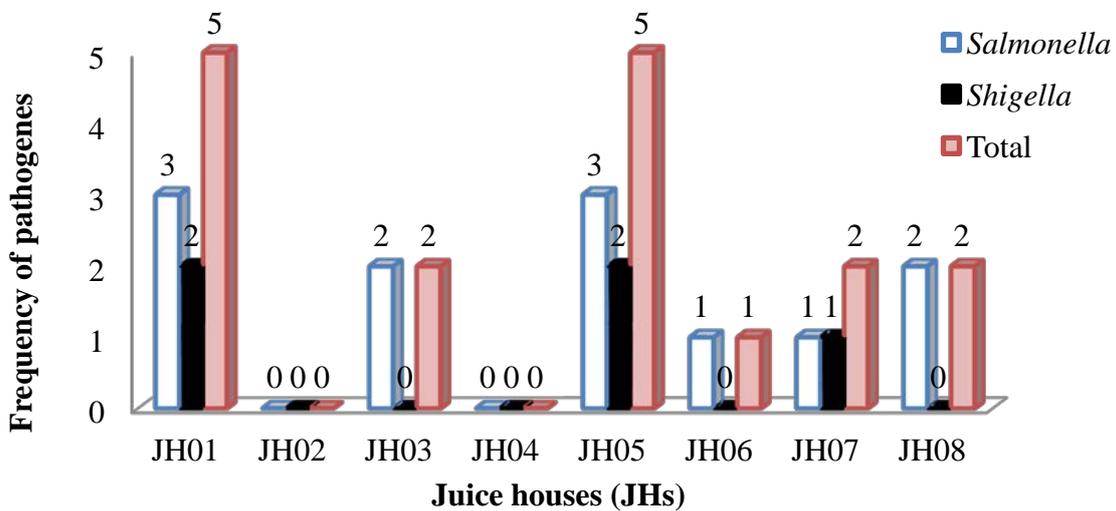


Figure 1: Frequency of isolated *Salmonella* and *Shigella* spp. from surface and peel of avocado and guava fruit samples across juice houses of Bahir Dar town, 2015.

The detection of pathogens like *Salmonella* and *Shigella* spp. in 25gm of food samples examined is regarded as potentially hazardous to consumers and is unacceptable for consumption [27]. This also indicates the necessity for observing hygienic conditions during production and preparation. Because such type of contamination can occur from water, soil, waste and humans who can be carriers of pathogenic species like *Salmonella* and *Shigella* that eventually transfer these foodborne hazards to consumers [24]. So, it is suggested that regular monitoring of hygienic conditions and the quality of fruits that used for preparation of juices and raw consumption must be introduced to protect any future pathogen outbreaks and/or to decrease the density of microbial contaminants from the surface of the fruits [25].

3.3 Assessment of Risk Factors for Fruit Contaminations

 *Corresponding author. Tele (+251)918702656
 E-mail address: muchie.sh09@gmail.com
<http://dx.doi.org/10.29322/IJSRP.8.9.2018.p8115>

The socio-demographic profile of respondents is presented in (Table 4), altogether there were 40 volunteer personnel in eight juice houses (5 in each juice house) were interviewed; majority 33 (82.5%) of them were females and 7 (17.5%) of them were males. All the respondents were less than 35 years old. Almost half of the respondents 18 (45%) completed secondary school, 9 (22.5%) of the respondents no schooling, 9 (22.5%) completed primary school, 4 (10%) were completed vocational and above. Majority of the respondents 31 (77.5%) did not get training on fruit management systems. However, only 9 (22.5%) of the respondents had professional trainings related to safe fruit management and handling practices that takes its own part to reduce high foodborne contaminations [26].

Table 4: Association of socio-demographic profiles with isolation of *Salmonella* spp. (n = 40).

Parameters	Frequency (%)	<i>Salmonella</i> spp.		X ² (P-value)
		Positive No (%)	Negative No (%)	
Sex				
Male	7 (17.5)	2 (28.6)	5 (71.4)	0.008 (0.93)
Female	33 (82.5)	10 (30.3)	23 (69.7)	
Age				
≤19	7 (17.5)	1 (14.3)	6 (85.7)	1.076 (0.73)
20-29	27 (67.5)	9 (33.3)	18 (66.7)	
≥30	6 (15)	2 (33.3)	4 (66.7)	
Educational Status				
No schooling	9 (22.5)	4 (44.4)	5 (55.6)	2.698 (0.44)
Primary school	9 (22.5)	3 (33.3)	6 (66.7)	
Secondary school	18 (45)	5 (27.8)	13 (72.2)	
Vocational and above	4 (10)	0	4 (100)	
Training on fruit management				
Trained	9 (22.5)	0	9 (100)	4.977 (0.03)*
Not trained	31 (77.5)	12 (38.7)	19 (61.3)	

*= Statistically significant association

Regarding fruit management systems and handling practices presented in (Table 5), most 27 (67.5%) of the respondents reported that they purchased fruits from whole sellers, 10 (25%) also from open markets retailers and the remaining 3(7.5%) directly from producers. After purchasing fruits, majority 37 (92.5%) of the respondents temporarily stored their fruits on shelf outside the juice house in a condition that exposed to temperature abuse and dust. The other 3 (7.5%) of the respondents were stored in refrigerator that inhibit microbial growth. It was also observed that, most 24 (60%) of the respondents stored fruits in bulk for the next more days, 6 (15%) of the respondents also stored fruits in bulk for the coming one day and other 5 (12.5%) of them stored in bulk for the day's use only. Such type of fruit storage systems may contribute to microbial cross-contamination between and/or among fruit types. Only 5 (12.5%) of the respondents reported that they stored fruits separately in type for the day's use that can reduce cross-contamination [27]. Regarding the shelf-life of fruits, 22 (55%) of the respondents disclosed that avocado fruits can't stay for long period of time followed by mango and orange 12 (30%) and 6 (15%), respectively.

Table 5: Association of fruit management systems with isolation of *Salmonella* spp. (n = 40).

*Corresponding author. Tele (+251)918702656
E-mail address: muchie.sh09@gmail.com
<http://dx.doi.org/10.29322/IJSRP.8.9.2018.p8115>

Parameters	Frequency (%)	<i>Salmonella</i> spp.		X ² (P-value)
		Positive No (%)	Negative No (%)	
Sources of fruits				
Open market	10 (25)	3 (30)	7 (70)	0.018 (0.99)
Whole seller	27 (67.5)	8 (26.6)	19 (70.4)	
Producers	3 (7.5)	1 (33.3)	2 (66.7)	
Temporary storage of fruits				
Shelf	37 (92.5)	12 (32.4)	25 (67.6)	1.390 (0.24)
Refrigerator	3 (7.5)	0	3 (100)	
Ways of fruit storages				
In bulk for the day's use	5 (12.5)	1 (20)	4 (80)	11.43 (0.00)*
In bulk for the next day's use	6 (15)	1 (16.7)	5 (83.3)	
In bulk for more days use	24 (60)	10 (41.7)	14 (58.3)	
Separately for day's use	5 (12.5)	0	5 (100)	
Fruits can't stay for long period of time				
Avocado	22 (55)	9 (40.9)	13 (59.1)	3.961 (0.14)
Mango	12 (30)	3 (25)	9 (75)	
Others (Orange)	6 (15)	0	6 (100)	

*= Statistically significant association

Concerning fruit handling and washing practices as presented in (Table 6), majority 30 (75%) of the respondents used fruits for juice preparation without washing that might be responsible for the transmission of pathogens to the consumers or products [28]. However, 10 (25%) of the respondents disclosed that they washed fruits before juice preparation. Hence, washing of fruits before juice preparation is the best means to remove microbial loads, dusts and soil on the surface of fruits. Most 29 (72.5%) of respondents responded that fruits handled by hand only to move fruits from storage to preparation site that can increase the probability of cross- contamination [29]. The remaining 11 (27.5%) responded fruits handled by handling materials used as barrier between hands and fruit contact. However, none of the respondents were used glove to move fruits in juice houses. Majority 32 (80%) of the respondents reported that they did not wash their hands before and after every fruit handling services, this can contribute for microbial contaminations. only 8 (20%) of the workers washed their hands before and after fruit handling.

Table 6: Association of fruit handling and washing practices with isolation of *Salmonella* spp.
(n = 40)

*Corresponding author. Tele (+251)918702656
E-mail address: muchie.sh09@gmail.com
<http://dx.doi.org/10.29322/IJSRP.8.9.2018.p8115>

Parameters	Frequency (%)	<i>Salmonella</i> spp.		X ² (P-value)
		Positive No (%)	Negative No (%)	
Washing of fruits before juice preparation				
Yes	10 (25)	0	10 (100)	5.714 (0.02)*
No	30 (75)	12 (40)	18 (60)	
Handling practices of fruits				
Hand only	29 (72.5)	12 (41.4)	17 (58.6)	6.502 (0.01) *
Hand with glove	0	0	0	
Handling materials	11 (27.5)	0	11 (100)	
Washing of hands before and after fruit handling				
Yes	8 (20)	0	8 (100)	4.286 (0.04)*
No	32 (80)	12 (37.5)	20 (62.5)	

* = Statistically significant association

Concerning the sanitary condition of juice houses and personal hygiene, it was observed that most 27 (67.5%) of the respondents used open space to dispose liquid wastes that provides nutrients for flies and other microbes which may carry foodborne pathogens [30]. Only 11 (27.5%) of the respondents used proper septic tanks with receptacle. However, 2 (5%) did not use liquid waste disposal, instead they used toilet for liquid wastes that may expose for fecal contamination. Like liquid wastes, majority 24 (60%) of the respondents had no specific and proper solid waste disposal, only 13 (32.5%) had proper solid waste disposal with lid and 3 (7.5%) did not use solid waste disposal. Majority 29 (72.5%) of juice house personnel did not wear clean apron and hair cover, this may expose for body contact between fruits and increase cross-contamination. The remaining 11 (27.5%) of the workers wore apron and hair cover. Majority 27 (67.5%) of the respondents did not trimmed their fingernails for the purpose of fruit safety but 13 (32.5%) trimmed their fingernails. Finally, only 8 (20%) followed regular medical checkup for knowing their health status related to foodborne outbreaks.

Table 7: Association of sanitary conditions with isolation of *Salmonella* spp. (n = 40).

Parameters	Frequency (%)	<i>Salmonella</i> spp.		X ² (P-value)
		Positive No (%)	Negative No (%)	
Liquid waste disposal				
Open space	27 (67.5)	10 (37)	17 (63)	10.018 (0.01)*
Septic tank	11 (27.5)	0	11 (100)	
Note available	2 (5)	2 (100)	0	
Solid waste disposal				
Proper with lid	13 (32.5)	3 (23.1)	10 (76.9)	2.225 (0.33)
Improper without lid	24 (60)	7 (29.2)	17 (70.8)	
Note available	3 (7.5)	2 (66.7)	1 (33.3)	
Wearing of apron and hair cover				
Yes	11 (27.5)	1 (9.1)	10 (90.9)	3.159 (0.08)

*Corresponding author. Tele (+251)918702656
E-mail address: muchie.sh09@gmail.com
<http://dx.doi.org/10.29322/IJSRP.8.9.2018.p8115>

No	29 (72.5)	11 (37.9)	18 (62.1)	
Cutting of fingernails short				
Yes	13 (32.5)	2 (15.4)	11 (84.6)	1.959 (0.16)
No	27 (67.5)	10 (37)	17 (63)	
Regular checkup of the health status				
Yes	8 (20)	2 (25)	6 (75)	0.119 (0.73)
No	32 (80)	10 (31.3)	22 (68.7)	

*= Statistically significant association

In this study, all of the risk factors mentioned for isolation of *Salmonella* spp. showed various frequencies in isolation of *Shigella* spp. as well in both fruit surfaces and peel parts of each fruit types from each juice houses. However, they did not show statistically significant association with isolation of *Shigella* spp. all ($p > 0.05$).

4. Conclusion

The study revealed that the microbial quality of avocado and guava fruits including their peel used for preparation of different juices had high counts of aerobic mesophilic bacteria, total coliform, fecal coliform, *S. aureus* and yeast and mold. This indicates that most fruits are exposed for microbial contamination and unsafe for human consumption in raw. It can also be concluded that avocado fruits and their peel had higher microbial loads than guava fruits and their peel. The microbial loads of each fruit surfaces were higher than the microbial loads of each fruit peel as well; this indicates the need of proper washing of fruits prior to juice preparation and raw consumption. Most of the microbial loads of each fruit samples were higher than the microbial limits set for ready-to-eat foods including fruits and vegetables in Gulf regions and other parts of the world. So, juice vendors that produce freshly squeezed juices from these fruits should be aware that preventative measures through food safety control strategies is important. Further study should be recommended on other fruit types in different juice houses together with isolation of other pathogens.

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The Impact of Drug Economy on Macroeconomic Aggregates: Evidence – Afghanistan

Asst. Prof. Rahmatullah Pashtoon

(M.B.A. Financial Management, SPSS IBM, DIR, DIB – Pune, India)
HoD, National Economics Dept., Economics Faculty, Kandahar University
External Peer Reviewer, Ministry of Higher Education, Afghanistan

Asst. Prof. Abdul Ahad Zahid

(MSc. Management and Economics – Ruhr University, Bochum, Germany)
Head of Quality Assurance Department, Kandahar University

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Abstract

The main problem that GDP and the BoP-data are confronted within developing countries is the fact that informal and illegal transactions are not included in this data. Therefore, the published statistics do not show a true picture with respect to developing countries' economic performance. This problem is tremendously large in Afghanistan, a country with a very large drug sector. The main objective of this study is to investigate the impacts of the drug (opium and heroin) sector on macroeconomic aggregates in Afghanistan over the period of 2011 – 2015. The study is based on a descriptive statistical approach, using GDP measurement approaches, BoP format and floating exchange rate regime theories. The net export values of the Afghan drug sector are gathered and secondary data is used. Results show that Afghanistan's actual¹ GDP was an estimated to US\$ 18.74 billion by 2011, of which US\$ 2.4 billion is share of drug income. In the same year actual² trade deficit was estimated to US\$ -5135million, however, drug income offsets the deficit by US\$ 2400 million. Furthermore, due to a huge trade deficit Afghani must loss its value because Afghanistan's central bank has to supply Afghani and buy foreign currency to offset the trade deficit gap, however, Afghani is not depreciated yet. Thus, the drug income circulates in currency market of the country, which keeps Afghani exchange rate stable. Finally, conclusions are made that the drug sector made official macroeconomic data unrealistic and positively supported GDP, balance of payments and Afghani exchange rate in the country.

Keywords: Afghanistan, Trade Deficit, Current Account Adjustment, Foreign Exchange, Underground Economy

JEL Classification: N55, H62, F32, F31, E26

Description of Data

¹ In 2011, Official GDP was estimated to US\$16,34 billion and drug GDP US\$ 2.4 billion. Thus, actual (official plus drug) GDP = 16,34 + 2.4 = US\$ 18.74 billion.

² In 2011, Official trade deficit=-7,535, Net drug export US\$ 2400 million. Thus, Actual trade deficit US\$-5135 million.

In recent years a significant number of researches have focused on the relationship between drug economy and macroeconomic aggregates, these studies have used different data sets and empirical strategies. It has long been thought to have a huge impact on the GDP, BoP and exchange rate. Thus, to identify aggregate financial inflow of drug (opium and heroin) economy as well as show its impacts on official GDP, BoP and Afghani exchange rate in Afghanistan, secondary data was used. Secondary data was collected due to the difficult and cost intensive alternatives, such as interviews. However, currently there are a number of accurate and detailed joint studies on Afghan drug economy, conducted by national and international organizations such as: CSO (Central Statistics Organization, Afghanistan), MCN (Ministry of Counter Narcotics, Afghanistan), IMF (International Monetary Fund), WB (World Bank), UNEP (United Nations Environment Program), UNODC (United Nations Office on Drug and Crime), DAB (Da Afghanistan Bank). Furthermore, a descriptive statistical approach was used to analyze the data and the data collected for this study include the following economic indicators.

- 1) Annual monetary value of opium and heroin
- 2) Opium and heroin production quantities and provinces
- 3) Annual reports on GDP, BoP and Afghani exchange rate
- 4) Drug export values
- 5) Afghani exchange rate against US\$ and Euro
- 6) Drug trafficking routes

The size of Afghan unobserved (illegal and informal) economy is large and extremely complicated to estimate. For instance, large numbers of timber and precious stones are smuggled as well as large numbers of legal activities are done informally. Therefore, this study only focuses on the magnitude of opium's and heroin's financial contribution that disappears from official statistics specially GDP, BoP and Afghani real exchange rate.

Research Question/Theoretical contextualization

Afghan Drug Market

Potential opium and heroin cultivation area in Afghanistan:

UNODC (2015, p. 12), reported that the total area under opium poppy cultivation took place in the Southern, Eastern and Western regions of the country over the period 2011-2015 (Table 1).

Table 1: Opium poppy cultivation area in Afghanistan, 2011-2015 (Hectares)

Year	2011	2012	2013	2014	2015
Area under opium- poppy cultivation	131000	154000	209000	224000	18300

Source: Processing of author on data provided by UNODC & MCN (2015, p. 12)

Potential opium /heroin production and trend in Afghanistan:

Opium and its derivatives produced in Afghanistan are trafficked in form of raw opium and pure heroin³, seized, consumed domestically in various forms, stored for later use, etc. In addition, Afghan drug export routes are Turkey (important transit country for opium and heroin trafficked from Afghanistan to Europe), Central Asia, Pakistan and Iran. Hence, table 2 shows the potential size of opium and heroin produced and exported in each year of interest.

Table 2: Potential opium & heroin production, cultivation area and export values, 2011-2015 (Tons)

Year		2011	2012	2013	2014	2015
Potential opium yield (tons)		5800	3700	5,500	6400	3300
Potential heroin produced (tons)		83	264	364.5	413	181
Domestic consumption (tons)	Opium	175	175	175	175	175
	Heroin	12	11.9	12	12	8
Seized in Afghanistan (tons)	Opium	42	80	155	116	66
	Heroin	26.4	61	9,7	31	10
Ready for export (tons)	Opium	5315	1595	2200	2200	1800
	Heroin	44.6	191.4	342.85	370	163

Source: Processing of author on data provided by UNODC & MCN (2015, pp. 12-33)

The historic findings show that massive illegal /unobserved economic transactions take place in the developing world that results to bias official economic statistics. Nevertheless, in order to find possible solutions for the research question some theories, definitions and views on unobserved/drug economy and its relation with official statistics are analysed. Drug (heroin and opium) production and distribution is a key income generating product in Afghanistan. However, drug is an illegal economic activity, therefore, its financial inflows are excluded from official macroeconomic reports. This exclusion strongly impacts macroeconomic indicators as well as diverts the actual economic performance of the reporting country.

All goods and services produced in an economy for the purpose to be supplied and demanded in markets, whether they are licit or illicit, that escape from official estimations in GDP and Bop is known as unobserved economy (Schneider & Enste, 2000).

Afghan central statistic organization(CSO) has confessed that most income generating activities and transactions take place informally and thus make it complicated to evaluate and measure the exact size of aggregate income, expenditure and output. Although, in such a complicated situation formal data collection is difficult to estimate, but the CSO struggles to estimate the GDP using the expenditure approach. The CSO further added that all smuggled and illegal items are not included in official macroeconomic reports, neither in form of output nor in form of income (Afghanistan Central Statistics Organization, 2014/2015, p. 131).

Gross Domestic Product (GDP) is the prevailing market value of all final products produced within a country in a given period of time, usually three month or a year (Mankiw, 2012, p. 497).

³ A conversion ratio of 7:1 (7 kilograms of opium are needed for producing one kilogram of heroin of unknown purity) was used and out of every 100 kilograms of opium, 59 kilograms are converted into UNODC (2015).

Opium and its derivatives are the significant economic strength for Afghan economy, as the net monetary value of Afghan opium and heroin economy equaled approximately half of the country's gross domestic product (GDP) in 2004 and compromised 15% of Afghanistan's GDP in 2011 (Civil- Military Fusion Centre (CFC), 2012).

The United states developed a series of accounts and measuring methods (aggregate income, aggregate expenditure and aggregate production method) in 1964 that was used to evaluate the overall economic performance of a nation. These methods deliver identical results although, data used in measuring process is collected from public and private sectors (Landefeld, et al., 2008, p. 196).

According to Pilbeam (2013, p. 32), BoP (balance of payments) is a scientific description of all economic transactions of a specific economy undertaken annually with the rest of the world. It is the most significant statistical report of an Economy, as it shows the size of goods and services exported and imported. Moreover, it shows whether a country has borrowed much from or lent to foreigners as well as whether the central bank has increased or decreased its foreign currency reserves. BoP is divided into following sub- accounts:

- I The current account,
- II The capital & financial accounts,
- III The settlements account.

Currency inflows and outflows through exports and imports of goods with the rest of the world is recorded in the statement of current account. Capital & financial account records changes in assets and liabilities of private & public sectors and finally the settlement account deals with changes in assets and liabilities of central bank (Pilbeam, 2013, p. 32).

Exchange rate, is known as the price of one currency in term of another. In flexible exchange rate regime, the exchange rate can be determined by demand and supply forces, in this regime the central bank does not play any role to intervene or to fluctuate the exchange rate. However, sometimes the central bank is forced by a third party either to appreciate or depreciate the exchange rate. Thus, this intervene is called "dirty Float". Consequently, the central bank intervenes by suppling and demanding foreign currencies in order to reverse trade deficit and trade deficit causes to run capital account in surplus (International Economics Study Center, 2007).

Based on literatures opium and heroin production is a key income source in Afghanistan and for this reason potential export value of opium and its derivatives attracted the most attention of authors. Drugs are the last economic factor among many that defines enormous macroeconomic impact on Afghanistan's official economic performance. Its impact on the economic performance of the legal sector actually depends on what share/size of this export value actually enters into the economy, how this share is being divided between different actors, and how these different actors have been allocating their income between investment, savings and consumption. Thus, the net export value of drug economy, which is excluded from officially reported GDP, generates demand for domestic as well as foreign products. Although, this amount is not recorded in official balance of payments data, it has a net: positive impact on official balance of payments statistics (Martin & Symansky, 2006, p. 30).

According to Dornbusch & Fischer (1985, p. 25), numerous illicit and informal economic dealings that reach the market not only leak from official gross national product (GNP) measures but also outflow from rule and regulation. For instance, those who are paying cash for Handyman's services could be contributing in an economic dealings. Yet, its value is not recorded in GNP statistics. Similarly, economic transactions undertaken by friendly native bookmakers, perhaps dissaper from the economy's Gross National

Product (GNP) measuring process. Consequently, all illicit and informal particularly drug dealings disappear from official GNP estimation process.

Most economic activities vanish from macroeconomic data collection process, such as underground economic activities, informal economic activities, illegal economic activities as well as those economic activities which are undertaken for private purposes. Additionally, some economic activities may have leaked from official GDP estimation process because of discrepancies in elementary data collection process. Thus, such economic activities are the representative of un-observed economy. Therefore, income generated and products produced through these channels are excluded from the basic macroeconomic statistics (OECD, 2002, p. 36).

Opium cultivation is illegal but labor intensive and the most expensive product among all agricultural products in Afghanistan. Afghan drug trade (Opium and heroin) generates more than one-third of the whole national income, Afghan farmers receive billions of US\$ each year via opium and heroin production and inject a massive income into Afghan rural economy. Hence, Afghan drug industry has been supporting Afghan balance of payments positively and facilitating conservative macroeconomic management and has been supporting domestic currency (Ward & Byrd, 2004, p. 26).

The theoretical base of this study is based on the studies and definitions of well-known authors on unobserved /Afghan drug economy, GDP, BoP and Afghani exchange rate against US\$ and Euro. This paper is a scientific illustration which shows that drug economy plays an important role in Afghanistan's official economic sector, therefore, strongly impacts and supports the entire macroeconomic indicators particularly GDP, BoP and Afghani real exchange rate in the country over the period of 2011-2015.

Large Literature exists about the nature of unobserved economy which declare that monetary value of unobserved economy is excluded from official statistics. This exclusion creates variation and misgauge official macroeconomic data measurement process. As GDP and BoP gauge the size of entire economic performance of the country. Similarly, the size of Afghan economy is guided by official statistics on GDP and BoP. However, there is a heavy vanished force in today's Afghan market which is recognized for its fabulous economic impact on official statistics, called drug economy. Thus, Afghanistan officially reported GDP and BoP -statistics do not represent the actual size of Afghanistan's macro-economic performance. Afghan drug and informal economy is enormously large and a complicated area in term of estimation. Therefore, this study only focuses on Afghan drug / opium & heroin production and its financial contribution that disappear from licit GDP and BoP statistics as well as shows its impact on Afghani exchange rate against US\$. A detailed description of the changes induced by drug inflows on GDP, BoP and Afghani exchange rate will be carried out guided by the following research question.

Given the importance of Afghanistan's drug economy, to which extent reported macroeconomic aggregates (GDP& BoP) may be biased by the unrecorded and illegal transactions of the country's drug economy?

In this question it is descriptively illustrated that summation of drug export value with officially reported GDP for each year in this research would be the actual Afghan GDP. Moreover, as drug export value partly offsets the trade deficit, therefore, the actual trade deficit would be obtained as: the drug related net export value is deducted from official trade deficit so the deviation is the impact of the drug sector. Furthermore, in case of huge trade deficit Afghani must be depreciated because Afghanistan central bank has to buy foreign currency in order to offset the trade deficit gap. But Afghani is not depreciated yet. Because it is the drug sector that attracts foreign currencies and indirectly gets into circulation and keeps Afghani exchange rate stable in the country.

Field research design/ Methods of data gathering

Afghanistan is well-known for the cultivation of opium poppy and production of opium derivatives specially heroin. The key concentrated regions for opium cultivation in the country are Hilmand, Farah, Kandahar, Badghis, Uruzgan, Nangarhar, Nimroz, Badakhshan, Day Kundi and some other provinces (UNODC and MCN, 2015, p. 12). Therefore, all the country has been chosen as research area over the period 2011 - 2015.

The major limitation of the descriptive analysis arises from following fundamental facts and deficiency of accurate representative data regarding the Afghan economy, is characterized as follow:

- 1) Less developed
- 2) War
- 3) Huge informal and illegal sector
- 4) Corruption.
- 5) ODA (Official Development Assistance)

Therefore, it is mentionable that due to the above limitation and huge informality in Afghan economy one cannot claim that the official macro-economic data explains exactly the real image of the economy. In addition, a high volume of duty free imports to NATO forces, NGOs, embassies, ministries and smuggling routes were considered as other main problems which makes the official data less representative for the descriptive analysis.

As a result, this study just relies on secondary data which was officially reported by Afghan authorities and international organizations. Secondary data reported by Afghan authorities and international organizations was provided as input to descriptively analyze and understand sufficiently large variation between Afghan officially reported data on GDP, BoP and drug /illegal data on GDP and BoP. Moreover, the author of this study brought legal and illegal values of economic performance together and found the actual size of Afghan macro-economic performance on GDP and BoP as well as explained stability of Afghani exchange rate over the period of 2011 - 2015.

Results

Based on descriptive analysis, this study has produced clear results in following steps:

The mixture of Afghanistan's official/licit GDP and the drug/illicit GDP will be actual GDP of the country over the period of 2011-2015, see (Table 3) and (Table 4).

(Table3) shows, Afghanistan's official/licit GDP over the period of 2011-2015. For instance, in 2011, the official/licit GDP of the country was estimated to US\$ 16.34 billion⁴ (UNODC, 2011, p. 3).

Table 3: Afghanistan's official (licit) reported GDP, 2011-2015 (US\$ billion)

	2011	2012	2013	2014	2015
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⁴ In 2012 US\$ 18.95 billion, in 2013 US\$ 21.04 billion (UNODC and MCN, 2013, p. 12), in 2014 amounted to US\$ 21.2 million (UNODC, 2015, p. 3). Similarly, in 2015 Afghan official reported GDP amounted to US\$ 19.2 billion (World Bank, 2016).

Official (licit) GDP	16.34	18.95	21.04	21.2	19.2
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Source: *Processing of author on data provided by UNODC/MCN (2011-2015) and World Bank (2016)*

(Table 4) demonstrates, that in 2011 Afghan net and pure drug/illicit GDP⁵ was estimated to US\$ 2.4 billion UNODC (2011, p. 3)⁶.

Table 4: Afghanistan’s drug (opium/ heroin) GDP, 2011-2015 (US\$ billion)

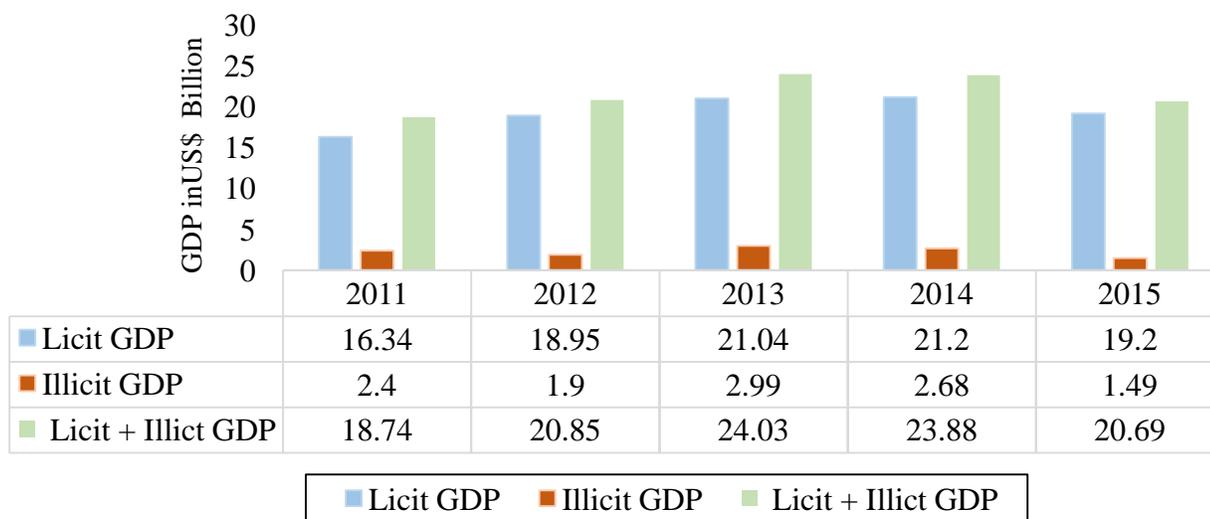
	2011	2012	2013	2014	2015
Drug (illicit) GDP	2.4	1.9	2.99	2.68	1.49

Source: *Processing of author on data series provided by UNODC (2011-2015)*

Drug-Economy Induced Inconsistencies in GDP Measurement:

Inconsistency between official and actual GDP can be realized by summing up licit and illicit/drug GDP. (Figure 1) shows that in 2011 the official reported GDP was estimated to US\$ 16.34 billion and illicit/drug GDP was estimated to US\$ 2.4 billion UNODC & MCN (2011- 2015). The macroeconomic impact of the drug sector is estimated to US\$2.4 billion on officially reported GDP statistics. Thus, the actual GDP, including drug income is obtained amounted to US\$18.74 billion in 2011.

Figure 1: Drug economy induces inconsistencies in official GDP, 2011-2015 (US\$ billion)



Source:

Processing of author on data series provided by UNODC (2011-2015)

Step Two:

Drug economy induces inconsistencies in trade balance over the period, 2011-2015

⁵ Net export value of opium and heroin

⁶ In 2012, US\$ 1.9 billion, in 2013 US\$ 2.99 billion UNODC (2013, p. 12), in 2014 US\$ 2.68 billion and in 2015 US\$ 1.49 billion (UNODC, 2015, p. 15).

Afghani Official trade balance deficit over the period 2011-2015:

According to IMF (2014, p. 44), Afghan economy still runs in huge trade balance deficit, the size of officially reported trade balance deficit is estimated in the following table over the period 2011- 2015 (Table 5).

Table 5: Net official trade balance, 2011-2015 (US\$ million)

Year	2011	2012	2013	2014	2015
Trade Balance	-7,535	- 9,499	-8,450	-7,928	-8,429

Source: Processing of author on data series provided by IMF (2014, p. 44) and IMF (2016, p. 27)

Afghan illicit (drug) trade export values:

Only opium and heroin are included, all other smuggling and informal related export values are excluded, such as the size of Afghan smuggled timber and precious stones. According to IMF (2014, p. 44), net export value of opium and heroin is shown over the period 2011-2015 (Table 6).

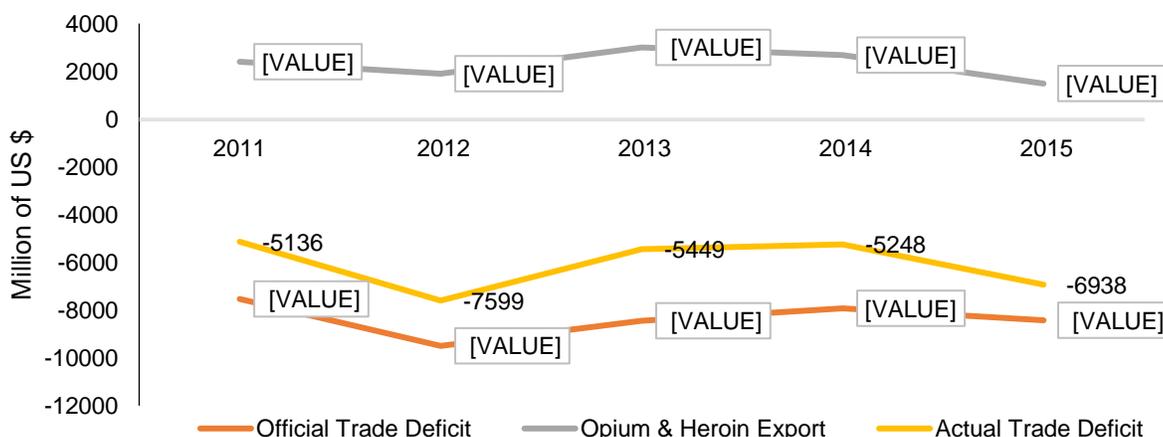
Table 6: Afghan Drug (opium &heroin) export values, 2011-2015 (US\$ million)

Year	2011	2012	2013	2014	2015
Exports Amount	2400	1900	3000 rounded	2680	1490

Source: Processing of author on data series provided by IMF (2014, p. 44) and IMF (2016, p. 27)

Thus, Afghan drug exports values positively impacts official trade deficit in a way that difference between the officially reported trade deficit and deficit after deducting drug export value would be the macroeconomic impact of drug on official trade deficit. This dissimilarity can be seen in (Figure 2). For instance: In 2011, official trade deficit was an estimated US\$-7536 million but owing to drug export this is not the actual deficit. In order to realize the actual trade deficit (licit export + Illicit export – licit imports), generated net income of the drug (opium and heroin) amounted to US\$ 2400 million is deducted from official trade deficit amounting to US\$ -7536 million. Thus, the actual trade deficit was US\$ -5136 million in 2011.

Figure 2: Afghan officially reported trade deficit and actual trade deficit, 2011-2015 (US\$ million)



Source: Processing of author on data series provided by IMF (2014, p. 44) and IMF (2016, p. 27)

Step Three:

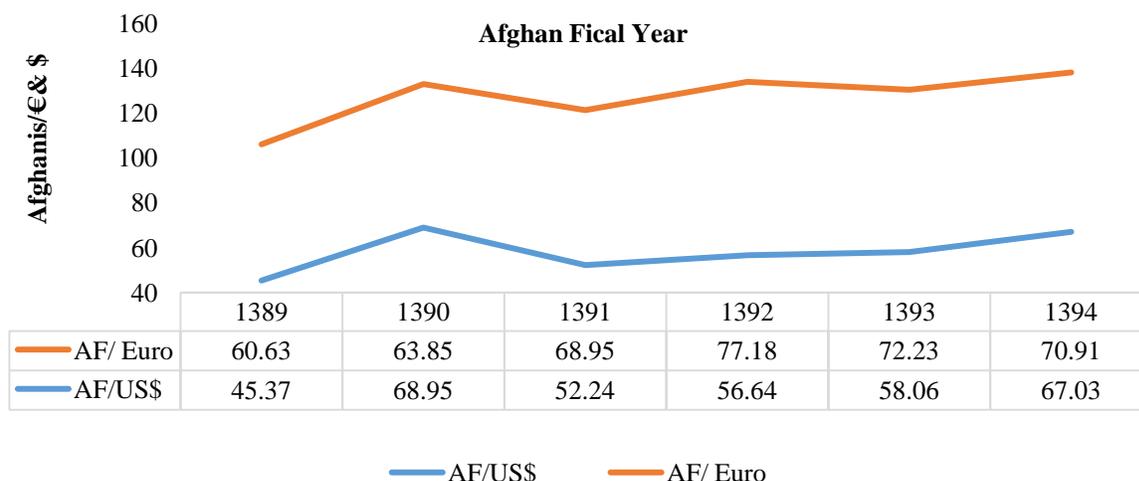
Afghan drug economy induces inconsistencies in (AFN/\$) and (AFN/Euro) exchange rate:

- Afghan GDP in 2013 was reported US\$21.04 billion.
- Drug GDP in 2013 was reported US\$2.99 billion.
- Official trade deficit in 2013 was reported US\$-8450 million.

Afghani exchange rate against US\$ and Euro looks almost stable from 2011 to 2015, see (Figure 3). In 2011, Afghani exchange rate= \$1/AFN 52.16 and at the end of fiscal year \$1/AFN56.64, hence it looks stable over the period 2011-2015 (Da Afghanistan Bank, 2016).

Thus, large current account deficit puts downward pressure on the Afghani exchange rate because current account deficit leads the country to supply domestic currency and buy foreign currencies, in order to offset the trade deficit gap. Supplying domestic currency gradually depreciate even collapses Afghani. However, this is the drug money that attracts billions of foreign currency into Afghan currency market, that can indirectly keep the AFN/\$ exchange rate almost stable, as illustrated in (Figure 3). Thus, Afghani exchange rate against US\$ and Euro over the period of 2010 - 2015 (equivalent to Afghan fiscal year 1389 – 1394) looks stable because of the huge drug sector inflows.

Figure 3: Daily average exchange-rate of Afghani / \$ & € for the Afghan fiscal year (1389-94)⁷



Source: Da Afghanistan central bank (2010-2015): <http://dab.gov.af/en/DAB/currency>

Discussion & Conclusion

Afghanistan is still suffering from huge unobserved economy, most of its economic activities take place illegally and informally, particularly in the huge illegal drug sector. The financial rewards and outputs of illegal and informal economic performances leak from official estimation of national economic performance. This study descriptively proved that, owing to the informal, shadow and

⁷ Afghan fiscal year from 1389 to 1394 is equivalent with, from 2010 to 2015.

illegal economic activities specially a terrific large drug sector, Afghanistan's officially reported GDP and BoP statistics do not signify the actual size of Afghanistan's economic performance over the period of 2011 - 2015.

In 2011, the officially reported GDP was an estimated US\$ 16.34 billion and drug income in the same year was estimated to US\$ 2.4 billion. Hence, US\$ 2.4 billion is a large amount, which disappeared from official GDP statistics. Licit GDP (US\$16.34 billion) and illicit GDP (US\$2.4 billion) is summated in a unique report. Thus Afghanistan's actual GDP for 2011 would be US\$ 18.74 billion, followed by US\$ billions leaked from official GDP reports over the period 2011-2015.

In addition, it is shown that Afghan BoP report is biased by unrecorded and illegal transactions of the country's drug economy over the period 2011-2015. For example, in 2011 Officially reported trade deficit was US\$ -7536 million in official reports. However, after deducting net drug export value of the same year amounting to US\$2400 million, the actual trade deficit reached to US\$ -5136 million. Thus, it seems that impact of drug sector was US\$ 2400 million on Afghan BoP statistics in 2011.

Furthermore, the study proved that Afghanistan's trade balance deficit makes the central bank of the country to supply domestic currency in order to buy foreign currencies and offset trade deficit. This policy usually puts downward pressure on Afghani exchange rate against other currencies and leads Afghani to depreciate or even collapse. But it did not happen to Afghan currency in this research period. Afghani is neither depreciated nor collapsed. Because this is drug sector that attracts as well as injects US\$ billions each year into Afghan currency market. Attraction and injection of foreign currency into domestic market indirectly support domestic currency and keep Afghani exchange rate stable and do not let the Afghani to be depreciated or collapsed but made it stable over the period 2011-2015.

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Impact of Human Activities on Physico - Chemical Condition of Yamuna River Water at Mathura

Ashok Kumar, *Dr. Praveen Sharma, Dr. D.D. Dwivedi,
DEPT. OF ZOOLOGY, BSA (PG) COLLEGE , MATHURA (UP) INDIA.
*Corresponding Author.

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Abstract: An attempt has been made to study on physico - chemical condition of Yamuna river water. Three sampling sites were selected for the study. The duration of study was July 2016 to June 2017. The parameters studied were temperature, turbidity, pH, hardness, TDS, DO, BOD, and COD were found above the tolerance limit. Thus the water of river Yamuna was unfit for human consumption.

Key words- Turbidity, pollution, pollutants, DO, BOD

Introduction

The riverine system of India has been the centre of human activities, and since the time immemorial, human dwellings gathered in the form of villages and cities near or around this system. Mathura, the sacred birth place of lord Krishna is situated on the right bank of holy river Yamuna flowing from Delhi to Agra direction.

Due to rapid civilization & industrialization, many pollutants (in the form of domestic, industrial, agricultural effluents, cremation residues etc.) disposed of directly or indirectly in the river Yamuna. Mathura being religious town, millions of pilgrims from the every corner of the world visit this place every year. According to a ritual, a bath in the river Yamuna gives the desired fruits of the devoties. Therefore, everyday there is a large gathering of people at the bank of the river Yamuna. Yamuna water receives pollutants in the form of detergents, flowers, raw milk, sweets and other pooja materials.

Material and Methods

From the chosen three sites, the sampling was done on second week of every month in glass bottles of capacity 300 ml. Some physico-chemical parameters were determined on the spot with the help of portable water detection kit (model No. CK 710, manufactured by Century Instruments Pvt. Ltd. Chandigarh). Other parameters were determined in laboratory from samples using the methods suggested by APHA- 1985, and NEERI manual 1986. The results were compared with standard permitting parameters as suggested by WHO and ISI.

Results and Discussion

Temperature is an important physical parameter. Temperature was found accordance with the seasonal changes. It ranged between 17.7°C to 34.7 °C It was higher in summer months and lower in winter months. Turbidity is caused by untreated and undecomposed organic matters, It is a common indicator of pollution, sewage and industrial waste. It was maximum (121 NTU) in July 2016 and minimum (67 NTU) in January 2017.

Table: Physico-chemical characteristics of river Yamuna
(Values are the average of Three different sampling sites in 2016-2017)

Parameter	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
Temperature (°C)	29.9	29.3	22.4	23.4	21.8	18.9	17.7	22.3	23.4	27.8	31.1	34.7
Turbidity (NTU)	121	117	107	87	77	104	67	72	91	73	87	111
pH	7.4	7.3	7.7	8.3	8.3	7.8	8.5	7.9	7.8	7.5	8.2	8.5
Hardness (mg/l)	467	482	390	3.4	340	432	432	294	408	378	341	417
TDS (mg/l)	497	411	401	526	588	477	477	503	651	605	616	675
TSS (mg/l)	419	407	478	381	437	501	501	422	478	432	477	505
DO (mg/l)	2.1	2.2	4.1	6.5	4.3	8.2	8.2	3.9	9.8	5.4	2.1	1.9
BOD (mg/l)	33.3	32.4	6.7	9.8	18.1	6.5	6.5	30.3	11.2	22.7	39.4	41.2
COD (mg/l)	44.2	30.4	14.5	22.2	33.1	19.4	19.4	33.8	21.0	54.4	46.8	55.4

The acidic or alkaline nature of water indicates by pH, the Yamuna water was found slightly alkaline. It ranged between 7.3 to 8.5. The findings are accordance with *Kumar and Sharma 2004, 2005*. Hardness of water is due to the presence of Ca and Mg salts. Hard water does not form lather with soap and have high boiling points. Hardness ranged between 294 to 482 mg/l.

Total dissolved solids indicate the severness of pollution. TDS show highly fluctuations. It ranged between 401 to 675 mg/l. (*Sexena et.al.1971*). total suspended solids were found higher in summer while lower in winter. TSS ranged between 381 to 505 mg/l. The observations were similar to *Mathur et.al. 1987, Sexena et. al. (1991)* and *Shangi et. al. 1993*.

Oxygen is essential for the decomposition of chemicals waste and dead matter. It ranged between 1.9 to 9.8 mg/l. It show highly fluctuating values (*Kumar and Sharma, 2005*). BOD is the amount of oxygen required by living organisms for the decomposition organic waste material. It was found very high in summer and lower in winter (6.1 to 41.2 mg/l). COD is the amount of oxygen required for decomposition of chemical wastes. A high value of COD shows a high accumulation of organic water in water body. It ranged between 12.1 to 55.4 mg/l. (*Shankar et al. 1986, Reddy el at, 1985, and Sanger et al 1983*).

Summary and Conclusion

Above study indicates that water quality of river Yamuna at Mathura is severely polluted and the use of its polluted water may cause severe health problems. Remedial measures are required to sustain the good quality of water and also to save the life of people.

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The Effect of Independent Board of Directors Composition, Independent Audit Committee and Firm Characteristics to The Integrated Reporting Disclosure of The Manufacturing Firms Listed in Indonesian Stock Exchange.

Abdullah¹, Taufiq², Luk Luk Fuadah³

Magister Ilmu Ekonomi, Universitas Sriwijaya
Email: Abdullahsaggaf@yahoo.co.id

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Abstract: *This research aims to analyze the effect of independent board of directors composition, independent audit committee, firm characteristics as (firm size and profitability) to the integrated reporting disclosure of the manufacturing firms listed in Indonesian Stock Exchange. The population used in this research consists from 150 firms period 2015-2017. Purposive sampling was implemented in this research. From 150 firms, only 51 firms were selected as research samples. The result showed that Independent audit committee and firm size had positive effect to the integrated reporting disclosure while Independent Board of Directors Composition and profitability had no effect to the integrated reporting disclosure.*

Keywords: *Independent Directors, Independent Audit Committee, Firm Size, profitability, Integrated Reporting*

1. Introduction

The maximization of the wealth of shareholder's is the ultimate goal of company's management (*shareholders wealth maximization*), which will result in maximizing firm's value (Brealey, 2012). But now the company must also be oriented to stakeholders (stakeholder oriented) if it wants to increase its company value. The biggest contribution to the global crisis in America in 2008 was caused by the company only gave priority to shareholders oriented without regard to stakeholders oriented (Stiglitz, 2009). Learning from the causes of the crisis, companies are encouraged to be more transparent and voluntary to meet the expectations of stakeholders (Lidia Oliveira, Lucia Lima Rodrigues, 2014).

In response to these concerns, many companies have sought to improve the information available for stakeholder decisions through the addition of financial reporting and reporting of non-financial information (Cohen et al., 2012). As for non-financial reporting, including corporate social responsibility and corporate sustainability approaches that have been used by companies, the approach still has some weaknesses because it is still separated from the financial statements of the organization so that it fails to create a link between sustainable issues and organizational strategy (Sirakaya-turk, Baloglu, & Mercado, 2015).

In 2011, an international institution named "The International Integrated Reporting Council (IIRC)" was established which made a reference for companies in reporting, both financial and non-financial. IIRC is an institution consisting of government, investors, companies, standard makers, accountant professions, and non-governmental organizations. This institution offers reporting standards for use by companies in order to report their activities, both financial and non-financial aspects which are important elements in the reporting. The reporting of this activity will be a single or integrated and interconnected with each other known as integrated reporting.

Some international guidelines used in the formation of integrated reporting structures are the Global Reporting Initiative (GRI), the Institute of Social and Ethical Accountability, and the International Integrated Reporting Council (ACCA, 2015). Integrated reporting is a brief communication about how organizational strategy, performance, and prospects of an organization can create short-term, medium-term, and long-term value (www.theiirc.org, 2013). An interesting phenomenon in the Indonesian capital market is that most companies that go public in Indonesia are family firms and government-owned companies. Whereas it is known

that the family firm and company owned by the government are concentrated ownership. However, according to the rules, companies that have been *go public* must have a separation between owner and management. The management cannot be intervened by other parties, yet it is possible that management will be intervened by the concentrated ownership so that it will influence the management in the disclosure of integrated reporting. The crisis case that hit government and private companies in Indonesia in 1998 was inseparable from concentrated ownership intervention in company management. It happened due to the ineffectiveness of the board of directors' oversight function and the lack of transparency of the board of directors and audit committee in disclosing information.

Considering the new integrated reporting study is still less study conducted in Asian region, especially in Indonesia, there are still many differences in research results on integrated reporting and typical corporate family companies in Indonesia indicating to have potential to intervene in corporate management and management's policies, therefore, further research is needed to examine the effect of the composition of the independent board of directors, independent audit committee and firm characteristics in form of firm size and profitability on the disclosure of integrated reporting on manufacturing sector companies in Indonesian Stock Exchange. Based on the background described, the researcher conducted a study entitled, "The Effect of the Composition of Independent board of Directors, Independent Audit Committees, and Firm Characteristics on the Integrated Reporting Disclosure at Manufacturing Sector Companies in Indonesian Stock Exchange"

2. Theoretical Foundations

a. Agency Theory

Agency theory discusses about the relationship between agents (management of a business) and the principal (business owner). In the agency relationship there is a contract whereby one or more principals govern the agent to perform a service on behalf of the principal and authorize the agent to make the best decision for the principal (Jensen and Meckling, 1976). A problem will occur when the principal cannot determine and know what has been done by the agent. This separation of company management and ownership can lead to a conflict of interest between management and owners which creates agency problems.

b. Legitimacy theory

Legitimacy is an acknowledgment of the legality of something. An organization's legitimacy can be said to be a potential benefit or source for the company to survive (Ashforth & Gibbs, 1990; Dowling & Pfeffer, 1975; O'Donovan, 2002). Legitimacy theory has a relationship with stakeholder theory. Legitimacy theory states that organizations continually seek ways to ensure their operations within the limits and norms prevailing in society (Deegan, 2002). In the perspective of legitimacy theory, a company will voluntarily report its activities when management considers that is what the community expects.

c. Composition of Independent Board of Directors

According to Hossain & Reaz (2007) states that the composition of an independent board of directors is a comparison between independent directors and the number of directors in the company. The existence of a composition of an independent board of directors within a company is expected to pressure the company to disclose all information voluntarily.

d. Independent Audit Committee

According to (Beasley et al., (2009) said that an independent audit committee is an independent monitoring unit that aims to ascertain the truth of corporate disclosure, based on the agency theory's perspective that an independent audit committee can detect or at least reduce fraud in reporting disclosure (Bronson et al., 2009).

e. Firm Size

Describing the size of a company indicated by total assets, total sales, average total sales and average total assets (Brigham and Houston, 2011).

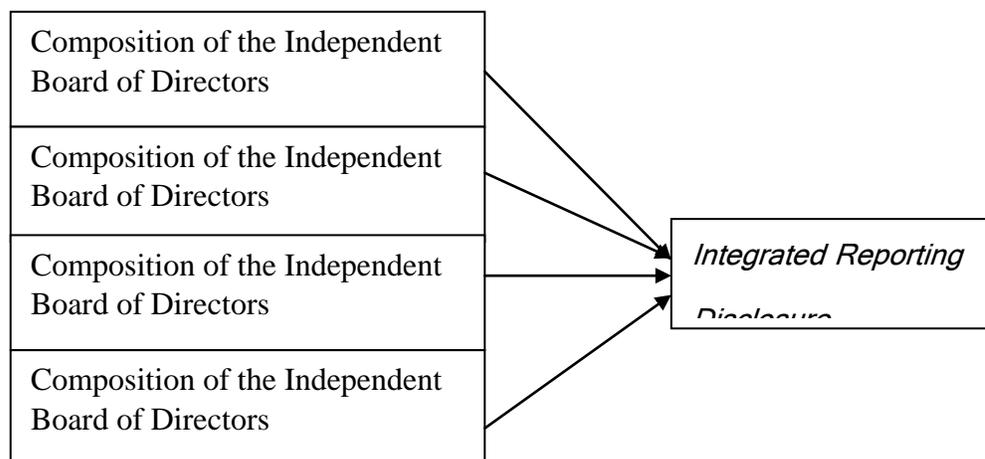
f. Profitability

Profitability is the company's ability to make a profit in relation to sales, total assets and own capital. In this study using the ratio of Return on Assets (ROA) as a proxy of profitability (Kasmir, 2012).

g. Integrated Reporting

Integrated reporting as a concise and integrated information communication process on how strategy, governance and remuneration, performance and prospects of an organization result in value creation in the short term, medium and long term (IIRC, 2013).

In this study there are four hypotheses as follow:



H1: Composition of the Independent Board of Directors influences the Disclosure of Integrated Reporting

H2: The Audit Committee affects the Disclosure of Integrated Reporting

H3: Firm Size affects the Disclosure of Integrated Reporting

H4: Profitability affects the Disclosure of Integrated Reporting

RESEARCH METHODOLOGY

The populations in this study were all manufacturing sector companies in Indonesian Stock Exchange in 2015-2017 total of 150 companies. But in this study the sample selection method used was purposive sampling, only the data that matches the existing sample criteria. The criteria are (1) Manufacturing sector companies registered on the Indonesia Stock Exchange in 2015-2017 (2) Companies that have voluntarily disclosed the integrated reporting in 2015-2017.

Based on the sample selection criteria above, the numbers of samples were 51 companies. The type of data needed in this study was secondary data which was analyzing the annual report of non-financial companies registered on the Stock Exchange in 2015-2017. The technique used was Multiple Linear Regression using the Statistical Package Social Sciences program (SPSS).

Operational Definition and Variables Measurement

a. The composition of Independent Board of Directors

The definition of composition of board of directors is a comparison between independent directors and the number of directors in the company (Hossain & Reaz, 2007). The composition of an independent board of directors has a tendency to pressure the company to disclose all information voluntarily (Michelon & Parbonetti, 2012). The measurement of the composition of the independent board of directors in this study refers to (Hossain & Reaz, 2007).

$$\text{Composition of independent board of directors} = \frac{\text{independent directors}}{\text{board of directors}}$$

b. Independent Audit Committee

The audit committee is an independent monitoring unit that aims to ensure the truth of company disclosure (Beasley et al, 2009). Based on the agency theory's point of view, that an independent audit committee can detect or at least reduce fraud in disclosure of reporting (Bronson et al, 2009). The measurement of an independent audit committee refers to (Ahmed Haji & Anifowose, 2016).

$$\text{The audit committee} = \frac{\text{independent audit committee}}{\text{all audit committee}}$$

c. Firm Size

Describing the size of a company indicated by total assets, total sales, average total sales, and average total assets (Brigham and Houston, 2011). This study uses total assets as a description of firm size.

$$\text{Firm Size} = \text{Ln (Total Asset)}$$

d. Profitability

Profitability ratios are the ability of a company to make a profit in relation to sales, total assets and own capital. In this study uses the ratio of Return on Assets (ROA) as a proxy of profitability (Kasmir, 2012).

$$\text{Return on Assets (ROA)} = \frac{\text{Net income}}{\text{Total asset}}$$

e. Integrated Reporting

The integrated reporting framework was introduced by The International Integrated Reporting Council (IIRC) at the G20 meeting in June 2011. Content analysis was used in this study to measure the disclosure of integrated reporting where the use of Content analysis refers to research (Ahmed Haji & Anifowose, 2016) using checklist consisting of 8 (eight) main principles containing 52 question items. These principles can be seen in appendix 3. When information is available given a score of 1 and if not available given a score of 0. Then to calculate the value of the Integrated Reporting Score (IRSCORE) refers to research conducted by (Lee & Yeo, 2015). The IRSCORE value is calculated based on the actual value of integrated reporting information provided by the company compared to the total value based on the checklist.

h. Method of Data Analysis

Data analysis method used in this study was multiple regression analysis. The initial model of this study is as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e_1$$

The test used in this study was a classic assumption test (normality test, multicollinearity test, autocorrelation test, and heteroscedasticity test), multiple regression test and hypothesis test.

4. Results and Discussion

Descriptive statistics are used to provide an overview or description of the data under the research by looking at mean, standard deviation, and maximum-minimum of values.

Table1 Descriptive Statistics

	Minimum	Maximum	Mean
INTEGRATEDREPORTING	.08	.61	.2748
The composition of Independent Board of Directors	.05	.69	.2805
Independent Audit Committee	.07	.70	.2946
FIRMSIZE	3.65	45.58	21.8104

PROFITABILITY -13.58 26.15 3.7439

Valid N (listwise)

Source: Data Processing Results

Based on the statistical descriptive results in table 1 shows that the average integrated reporting value is 0.2748 with minimum value of 0.08 and maximum value of 0.61, the average value of the independent board of directors is 0.2805 with minimum value of 0.05 and value maximum 0.69, the average value of the independent audit committee is 0.2946 with minimum value of 0.07 and maximum value of 0.70, the average value of firm size is 21.8104 with minimum value of 0.365 and maximum value of 45.58 and average value profitability of 3.7439 with minimum value of -13.58 and maximum value of 26.15.

**CLASSIC ASSUMPTION TEST
 result of the multicollinearity**

Table 2

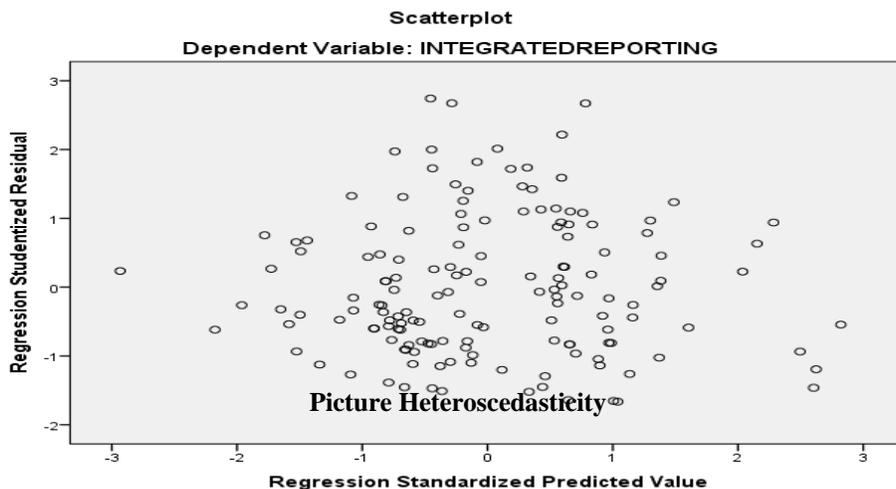
Variabel	VIF
The composition of Independent Board of Directors	1.215
Independent Audit Committee	1.275
FIRM SIZE	1.091
PROFITABILITY	1.040

Source: Data Processing Results

Table 2 above is the result of the multicollinearity test of the regression equation in this study. A regression detected multicollinearity if the VIF value is below 1 in the output coefficients. The VIF values of all variables are above 1, it can be concluded that this regression is free from multicollinearity or can be considered as tolerance value below 0.01.

Heteroscedasticity results

A regression is said to be detected heteroscedasticity when the residual scatter diagram forms a certain pattern. The regression results in Figure 3. below shows that there is no specific pattern shaping the image. Thus, it can be concluded that regression is free from heteroscedastic cases.



Autocorrelation Results

Table 4

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.447 ^a	.199	.178	.11037	1.575

Source: Data Processing Results

A regression detected autocorrelation when the D-W value > dU > dL. Based on the D-W table at p = 0.05, N = 153 and K 2, obtained score 1.17 and dU 1.54 dL. The results of the D-W value in this regression are found in table 4.4 of 1.575. These results indicate that the D-W > dU > dL value, it can be concluded that this regression model is free from autocorrelation.

Statistical Test

Overall Test (Test F)

Table 5

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.449	4	.112	9.214	.000 ^b
	Residual	1.803	148	.012		
	Total	2.252	152			

Source: Data Processing Results

Based on the estimation results of the effect of the composition of the independent board of directors, independent audit committee, firm size, and profitability of integrated reporting disclosures as shown in table 5 it can be seen simultaneously that the independent board of directors, independent audit committee, firm size and significant profitability variables affect the integrated reporting. This condition is indicated by the calculated F value of 9.214 which is much higher than the F table for α 5% and dt (4; 148) which is 2.37 or can also be seen from the significant value of $\alpha < 0.05$.

Partial Test (t test)

Table 6

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.183	.032		5.774	.000
	The composition of Independent Board of Directors	-.202	.078	-.210	-2.586	.011
1	Independent Audit Committee	.218	.067	.270	3.256	.001
	FIRMSIZE	.004	.001	.292	3.795	.000
	PROFITABILITY	.001	.001	.033	.435	.664

Source: Data Processing Results

Based on the results in table 6, partially the independent board of directors, independent audit committee, and firm size significantly affect the integrated reporting while profitability does not significantly affect the integrated reporting. The significance of the variables of the independent board of directors, independent audit committee, and firm size is indicated by t score is greater than t table for α 5% which is 1.96. While the insignificance of the effect of profitability on integrated reporting is indicated by t score which is 0.435 smaller than t table of 1.96. The effect of independent board of directors, independent audit committee, and firm size partially significantly affects the disclosure of integrated reporting seen from its significant value $< \alpha 0.05$, while the effect of partial profitability does not affect the disclosure of integrated reporting seen from its significant value $\alpha > 0.05$.

The research regression equation model is as follow:
$$Y = 0,183 - 0,202X_1 + 0,218X_2 + 0,004X_3 + 0,001X_4$$

Discussion

The Effect of Independent Board of Directors Composition on Integrated Reporting Disclosure

Based on the results of the partial t test, it shows that the composition variable of the independent board of directors in the manufacturing sector companies on the Indonesia Stock Exchange does not significantly affect integrated reporting; the form of the direction of its influence is negative. It is indicated by the t score higher than t table for α 5% which is 1.96. The results of this study cannot explain the application of agency theory. Negative influence can also be caused by the number of independent directors much less than the number of directors so that the role of independent directors is not significantly affecting. It is indicated by the small number of integrated reporting revealed. In addition, the implementation of integrated reporting by companies on the Indonesia Stock Exchange only began in 2014 so there were still few companies carried out such integrated reporting disclosures. When viewed from the R square value the role of directors and other variables in this study is only 19.9%, while the rest is explained by other variables.

The Effect of Independent Audit Committee on Disclosure of Integrated Reporting

Based on the test results above, it shows that the independent audit committee variable in the manufacturing sector companies on the Indonesia Stock Exchange significantly affect integrated reporting positively. According to the agency theory, the audit committee function is to monitor whether the company has carried out firm disclosures correctly. An independent audit committee is a very important part of the audit committee. The results of this study indicate that the independence of the audit committee of the manufacturing sector in the Indonesia Stock Exchange is sufficiently maintained or in other words that independent audit committees are not under pressure from parties who do not want the disclosure of integrated reporting.

Indeed, the role of independent audit committees is not too significant in the disclosure of integrated reporting; it is because the number of independent audit committees is less than the number of audit committees. According to Li et al., (2012) states that an independent audit committee improves the quality and credibility of financial and non-financial reporting processes. The results of this study support agency theory which predicts a positive relationship between the audit committee and the implementation of integrated reporting.

The Effect of Firm Size on Integrated Reporting Disclosure

Based on the test results above, it shows that the firm size variable in the manufacturing sector companies in the Indonesia Stock Exchange significantly affects the integrated reporting positively. The results of this study indicate that the manufacturing sector companies in the Indonesia Stock Exchange in conditions of an increase in size are detected from an increase in the total amount of assets from 2015 - 2017. When the firm size of the company grows, then the company will have more wealth and easy access to funding in the capital market so that it can finance for information disclosure.

Another condition that may cause a positive effect on firm size on integrated reporting in manufacturing sector companies on the Indonesia Stock Exchange is that the company encourages information disclosure. Information disclosure is to reduce agency problems because large companies face higher agency costs associated with high levels of asymmetric information compared to small companies.

The Effect of Profitability on Integrated Reporting Disclosure

Based on the results above, it shows that the profitability variable does not significantly affect the integrated reporting positively. According to signaling theory, profitability will be a positive signal so companies will disclose this information to the public in form of integrated reporting. The results of this study prove that there is no effect of profitability on the disclosure of integrated reporting. This condition indicates that there is a policy in the manufacturing sector companies on the Indonesia Stock Exchange that want to hold profits for funding from internal companies. Companies in Indonesia are mostly typical family firms that prioritize internal funding first, which comes from retained earnings after the new debt and stock issuance. This policy will encourage companies not to issue funding derived from profitability for the sake of integrated reporting disclosures so that the level of profitability does not have an effect on integrated reporting manufacturing sector companies on the Indonesia Stock Exchange.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion

Based on the results of the analysis shows that the audit committee and firm size affect the company's integrated reporting, while the composition of the independent board of directors and profitability does not affect the company's integrated reporting

Recommendation

It is recommended that the company management is expected to realize to increase the number of members of the independent board of directors and the independent audit committee and not to intervene with the management so that it is expected to give the role of independent directors to increase in the integrated reporting disclosure. And further recommendation for companies should set aside profits from the company in an effort to disclose greater integrated reporting.

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Harjola Marable Syndrome: A Rare Case Report

Shirish R Bhagvat, Mehdi Kazerouni, Suhas Parikh, Amol Wagh, Jalbaji P More, Prachiti S Gokhe

Department of Surgery, Wockhardt hospitals and Sir J. J. Group of Hospitals, Mumbai, India

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Abstract- Background: Compression of celiac artery due to unusual placement of median arcuate ligament which is ligamentous continuation of diaphragm over aorta results into symptom complex called as median arcuate ligament syndrome or Harjola Marable syndrome. All the patients who have unusually low lying median arcuate ligament may or may not be symptomatic.

Case report: We describe a case of 31 years old male patient who presented with complaints of pain in epigastric region and was diagnosed as celiac artery syndrome after extensive workup including OGD scopy, USG and CT angiography. He underwent laparoscopic release of median arcuate ligament which resulted in relief of symptoms.

Index Terms- Median arcuate ligament syndrome, celiac artery syndrome, Harjola-Marable syndrome, Celiac axis syndrome, Marable syndrome

I. INTRODUCTION

Celiac artery compression was first observed by Benjamin Lipshutz in 1917. It is also been called as Harjola-Marable syndrome, Marable syndrome, celiac artery compression syndrome, celiac axis syndrome, celiac trunk compression syndrome or Dunbar syndrome.

The median arcuate ligament is a ligament formed by joining of the left and right diaphragmatic crura join near the 12th thoracic vertebra. This fibrous arch forms the anterior aspect of the aortic hiatus, through which the aorta, thoracic duct, and azygos vein pass. The median arcuate ligament usually comes into contact with the aorta above the branch point of the celiac artery. Occasionally the median arcuate ligament passes in front of the celiac artery, below T12, compressing the celiac artery and nearby structures such as the celiac ganglia. In some of these individuals, this compression is pathologic and leads to the median arcuate ligament syndrome.

The syndrome most commonly affects individuals between 20 and 40 years old, and is more common in women.

Patients with MALS experience abdominal pain, particularly in the epigastrium, which may be associated with eating and which may result in anorexia and weight loss. Other signs are persistent nausea, and exercise intolerance. Diarrhoea is a common symptom.

Occasionally, abdominal bruit is heard in the mid-epigastrium.

Complications of MALS result from chronic compression of the celiac artery. They include gastroparesis and aneurysm of the superior and inferior pancreaticoduodenal arteries.

Median arcuate ligament syndrome is difficult to diagnose and is a diagnosis of exclusion. It is usually diagnosed after extensive workup including upper endoscopy, colonoscopy, and evaluation for gallbladder disease and gastroesophageal reflux disease (GERD).

II. CASE REPORT

31 years old male patient presented with complaints of pain in abdomen, mostly in epigastrium on and off since 1 year, aggravated since 6 months. Pain used to aggravate on food intake and after activity. Pain was associated with nausea and giddiness. Physical examination was essentially normal. Upper GI scopy was within normal limits. USG abdomen showed narrowing of celiac artery at the origin with increased in peak systolic Velocity. Diameter of celiac artery at origin 3.3 mm and distal celiac artery 6.6 mm suggestive of post stenotic dilatation.

PSV in erect position 134 cm/sec on inspiration and 204 cm/sec on expiration. On supine position, PSV increased to 304 cm/sec. Above findings were suggestive of ? celiac artery compression syndrome. Which was further confirmed with CT angiography. CT angiography showed severe narrowing of the origin of celiac artery due to thickened median arcuate ligament of diaphragm. There is post stenotic dilatation of celiac artery. Findings are suggestive of median arcuate ligament syndrome.

Patient underwent laparoscopic release of median arcuate ligament. Post op was uneventful.

5 months after surgery patient underwent repeat abdominal ultrasound which showed marked improvement in celiac artery PSV. USG with Doppler showed calibre of celiac artery at origin and in distal part to be 5-6 mm. PSV in erect position on inspiration and expiration 113 cm/sec and 124 cm/sec in supine position.

PSV and diastolic velocity of celiac artery were in expected range even in supine position and on expiration. No elevated velocity seen in supine position and on expiration which was suggestive of adequate release of median arcuate ligament.

III. DISCUSSION

Classically, MALS involves a triad of

1. Abdominal pain after eating,
2. Weight loss, and
3. An abdominal bruit.

Although the classic triad is found in only a minority of individuals. And as the symptoms are non specific it is difficult to diagnose.

There are various theories stating cause of pain in MALS.

- 1.Pain in MALS is assumed to be arising from inadequate blood flow through celiac artery due to Stenosis.
- 2.Compression of celiac ganglion.
- 3.Steal phenomenon which suggests diversion of blood to celiac artery from superior mesenteric artery through collaterals resulting in inadequate flow to intestine.

Although compression of celiac artery is widely accepted.

MALS is diagnosed using [duplex ultrasonography](#). It measure blood flow through the [celiac artery](#). Peak systolic velocities greater than 200 cm/s are suggestive of celiac artery stenosis . Further evaluation and confirmation can be obtained via [angiography](#) to investigate the anatomy of the celiac artery.

CT angiographic findings in MALS s/o

- 1.Proximal stenosis of celiac artery with post stenotic dilatation.
- 2.Indentation on superior aspect of celiac artery
- 3.Hook shaped contour of celiac artery.

These imaging features are exaggerated on expiration, even in normal asymptomatic individuals without the syndrome.

The hook-shaped contour of the celiac artery is characteristic of the anatomy in MALS and helps distinguish it from other causes of celiac artery stenosis such as [atherosclerosis](#).

Decompression of the celiac artery is the general approach to treatment of MALS. The mainstay of treatment involves an [open or laparoscopic surgical approach](#) to divide, or separate, the median arcuate ligament to relieve the compression of the celiac artery. Other modalities include stenting with dilatation although chances of recurrence are high, percutaneous angioplasty and aortoceliac bypass graft.

IV. CONCLUSION

Median arcuate ligament syndrome is a diagnosis of exclusion in a case of pain in abdomen, especially in case of post prandial fullness. It should be considered in patients complaining of post prandial pain in abdomen in whom other like GB disease, pancreatitis, acid peptic disease have been ruled out.

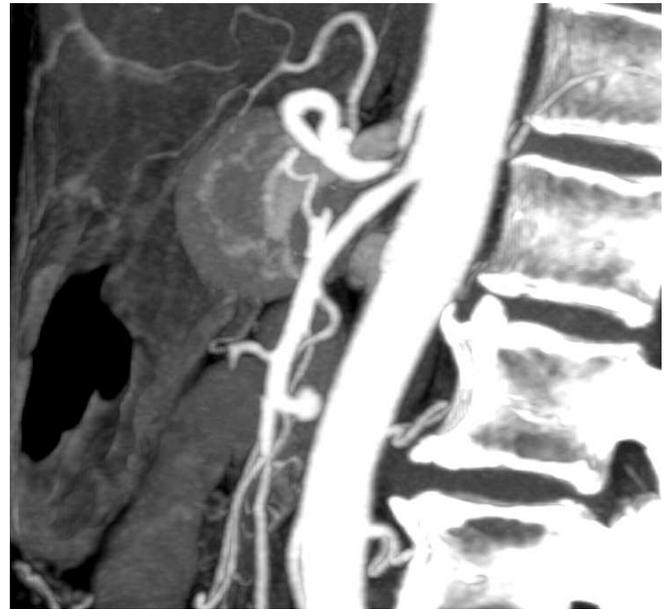


Figure ICT image on sagittal section showing narrowing at celiac artery origin and its hook shape contour.

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AUTHORS

First Author – Shirish R Bhagvat, Department of Surgery, Wockhardt hospitals and Sir J. J. Group of Hospitals, Mumbai, India

Second Author – Mehdi Kazerouni, Department of Surgery, Wockhardt hospitals and Sir J. J. Group of Hospitals, Mumbai, India

Third Author – Suhas Parikh, Department of Surgery, Wockhardt hospitals and Sir J. J. Group of Hospitals, Mumbai, India

Fourth Author – Amol Wagh, Department of Surgery, Wockhardt hospitals and Sir J. J. Group of Hospitals, Mumbai, India

Fifth Author – Jalbaji P More, Department of Surgery, Wockhardt hospitals and Sir J. J. Group of Hospitals, Mumbai, India

Sixth Author – Prachiti S Gokhe, Department of Surgery, Wockhardt hospitals and Sir J. J. Group of Hospitals, Mumbai, India

Project Leadership as a Determinant of Project Implementation in Grass-root Support Non-Governmental Organisations in Kenya

Mbogoh, Elizabeth Wanjira

College of Human Resource Development
Department of Entrepreneurship, Technology, Leadership and Management
Jomo Kenyatta University of Agriculture and Technology
Nairobi, Kenya
mbogohelizabeth@gmail.com

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Abstract-Effective Project Management is entirely dependent on an individual with great leadership skills, because without a good leader, a project is unlikely to be completed successfully. The successful completion of projects is the primary responsibility and goal of the Project Manager, who will have a lot of weight on their shoulders when it comes to making the right decisions. While some people possess natural leadership qualities, other leadership skills must be learned and adapted to ensure that each individual's approach to leadership is tailored to suit their own individual style and personality.

Index Terms- Project Leadership, Project Manager, Project Team, Jack-of all-trades, traits, abilities, tasks.

I. INTRODUCTION

In the early project literature, the notion of project leadership mainly departed from a task oriented perspective. Leadership was often seen as a "soft" or "human" phenomenon that was needed in order to make the project team deliver according to plan (Nixon et al., 2012). At the same time, it was already acknowledged that the management of projects and temporary systems had its own specific problems and characteristics (Roselle et al, 2015).

The basis of project management is the need for the rational handling of temporary tasks, tasks that could not be handled through permanent organizational arrangements. This points at project leadership as mainly a task-oriented phenomenon where relations could (temporarily) be set aside for the efficient execution of the project plan (Lindgren & Packendroff, 2009). Both projects and the people in them belong to a surrounding permanent organizational context that must be handled. Consequently, the traditional project leadership literature has focused on leadership as the simultaneous task of project-internal team management of technical specialists and project-external management of business managers and clients, often in the structural setting of matrix organizations (Donald, 2006). This does not make project leadership a unique phenomenon as compared to other forms of leadership; it neither implies special practical tools or tricks, nor does it imply a special theoretical body clearly separated from general leadership theory. But it is still a special sub-field of leadership, not least because it is socially constructed as such through the general differentiation of project management from other managerial fields.

When presenting the new leader category - the project manager - to the world, Leyla (2001) depicted a boundary-crossing Jack-of-all-trades able to handle both advanced technological issues and complicated business matters. It was not expected from this individual to be the best engineer or the best businessman in the organization, but the double abilities and the double set of experiences was. In project leadership literature, this reasoning has been extended to a specific interest in the individuals that are actually able to perform such a role.

Among the traits, abilities and tasks mentioned (and often mixed with each other) is the ability to motivate and make people enthusiastic about the project, to lead through ideas and visions, participative leadership creating a good organizational climate, handling external contacts and stakeholders, coordination and facilitating internal communication), solving conflicts, being able to handle stress and searching for adequate information (Kerzner, 2013). The project manager shall be more tasks oriented than the average leader, but at the same time there are studies indicating that increased relation orientation is positively correlate with project effectiveness. All this while the traditional tasks to plan, make decisions, maintain discipline and control performance remains. A proactive "firelighter" is what is needed, not a reactive "firefighter" constantly preoccupied with handling chaotic situations (Buckle & Lines, 2012).

Behind this view of the project manager as a Jack-of-all-trades, as both generalist and specialist, as both strategist and technician with eye for details, we find a theoretical conception of project leadership that is equally wide, drawing from several sources of inspiration. This conception can be found in several of the leading textbooks and professional publications in the field (Lock,).

II. METHOD

Research Design

The study used the Cross Sectional Survey research design which collects data to make inferences about a population of interest at one point in time. It is described as snapshot of the populations about which they gather data and they may be repeated periodically. They can be conducted using any mode of data collection.

The target population of this study consisted of 500 employees of Grass-root Support NGOs based in Embu County. The sample was obtained from the Target Population using stratified sampling. The target population was stratified into five strata according to the type of projects they do, namely Education, Health, Microfinance, Agriculture and Nutrition. Simple random method was then used to obtain a 10 % sample of each stratum. A sample size of 50 NGO employees was therefore selected.

The sample size derived from stratification is denoted by $n = n_1 + n_2 + n_3 + n_4 + n_5$,

where; n = sample size

n_1 = Education NGOs

n_2 = Nutrition NGOs

n_3 = Health NGOs

n_4 = Agriculture NGOs

n_5 = Micro-finance NGOs

Triangulation was used to obtain better quality of data. The data collection tools used were: a questionnaire (which was the main tool), an interview guide and an observation form. Data was analyzed using descriptive statistics and ANOVA.

Data Management and Statistical Analysis

Quantitative data collected were analyzed by descriptive statistics and presented through tables and in prose. This was attained through frequency distributions, means, percentages, and standard deviations, simple and cross tabulations. Qualitative data was coded into the different factors and sectors, and analysed through Content Analysis. The analysis utilized SPSS version 23 software to facilitate all computations and output for interpretation by the researcher. Descriptive analyses of the study was done and expressed through frequency tables, percentages, charts means and standard deviations. The researcher used a Likert scale ranging from 1 to 5 for analyzing items that were in nominal scale. Inferential statistics was used to test variable relationships in which regression analysis showed how the variables are related while correlation analysis indicated the degree of relationship between the variables. For these tests, ANOVA, t-test and F-test were used. The Ordinary least squares regression analysis was done and interpreted to determine the influence that the independent variables had on the dependent variable; implementation of projects.

Statistical Model

The regression model used is presented in the equation below.

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + e$$

Where:

Y is the dependent variable

β_0 is the constant term

$\beta [1, \dots, 5]$ is the regression coefficient of the independent variable

$X [1, \dots, 5]$ is the independent variable

e is the error term.

The study appreciates that there are other factors that may be affecting the implementation of projects in NGOs apart from the variables being investigated. These factors are represented by β_0 . The error term (e) represents "noise" or interference which denotes that there may be a non-linear relationship between the independent and dependent variable.

III. RESULTS

The research established that there was a strong relationship ($R=.663$) between predictor variable (project leadership) and the dependent variable (Project Implementation). The adjusted R-Square value is .596. This means that the predictor factor (project leadership) accounts for or explains 60% of the total variance in project implementation. The remaining 40% is explained by other variables which were not considered in this study.

Table 1: Model Summary for Project Leadership and Project Implementation

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.663 ^a	.317	.596	.632

a. Predictors (Constant): Project Leadership

b. Dependent Variable: Project Implementation in Grass root Support NGOs in Kenya

From the ANOVA statistics, the study established that the regression model had a significance level of 3.4% which is an indication that the model is ideal for making future predictions since the value of significance (p-value) is less than 5%. The model derived is therefore fit for the study.

Table 2: ANOVA for Project Leadership

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.301	6	1.050	2.625	.034 ^a
	Residual	13.601	34	.400		
	Total	19.902	40			

a. Predictors (Constant): Project Leadership

b. Dependent Variable: Project Implementation in Grass root Support NGOs in Kenya

From the findings in the table above, $t=.579$ imply that project leadership style influences project implementation by Grassroot Support NGOs in Kenya. However, significance level being .026 which is less than 0.05 shows that the study was statistically significant. It was therefore concluded that project leadership style has a significant effect on project implementation.

The findings on the extent of accessibility of project leader for consultation of project issues yielded $t=.554$ implying that the factor influences project implementation significantly. Consequently, $p=.043$ shows that the effect is statistically significant.

The extent of accountability of project leadership for training resulted in $t=.363$ implying a big degree of influence as well. This was made statistically significant by $p=.019$.

The findings on extent of accountability of project leadership for effective project communications' influence in project implementation resulted in $t=.908$ showing a very large influence of the factor in project implementation. A p value of .370 was consequently reported meaning the effect was statistically significant.

The extent of accountability of project leadership for organizational resources was also a factor that proved to be of significant influence on project implementation with $t=2.427$ and $p=.021$. This proves the extent of influence to be statistically significant for the study.

Finally, Extent of accountability of project leadership for organizational culture was a factor that was of great influence in project implementation with $t=1.416$ and $p=.046$ showing significance statistically.

The findings of this study are in tandem with Aosa, (1992) who in his study concluded that management was the key factor that influenced strategic plans formulation and implementation.

Table 3: Coefficients for Project Leadership

Model	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t	

1	(Constant)	.901	.429		2.099	.043
	Most effective project leadership style for implementation in respondent's organization	-.071	.123	-.091	.579	.026
	Extent of accessibility of project leader for consultation on project issues	.099	.178	.103	.554	.043
	Extent of accountability of project leadership for training	.063	.173	.061	.363	.019
	Extent of accountability of project leadership for effective project communication	-.193	.212	.191	.908	.070
	Extent of accountability of project leadership for organizational resources	.496	.204	.466	2.427	.021
	Extent of accountability of project leadership for organizational culture	.218	.154	.235	1.416	.046

a. Dependent Variable: Project Implementation in grass root Support NGOs in Kenya

The stated hypothesis in this study was;

H₁: Project Leadership has a positive significant effect on project implementation in NGOs in Grassroot Support Kenya.

All other predictor variables were significant with p<0.05 except Extent of accountability of project leadership for effective project communication. Therefore, accept the hypothesis in this predictor variable (project leadership).

The regression equation from this output was:

$$Y = .901X_1 - .071X_2 + .099X_3 + .063X_4 - .193X_5 + .496X_6 + .219X_7$$

IV. DISCUSSION

The research through statistical calculations established that there was a strong positive relationship between the two variables, i.e. independent variable (project leadership) and the dependent variable (Project Implementation). Grassroots Support NGOs in Kenya were found to portray aspects of leadership in many of their projects to prove that the success of the projects they had undertaken could be attributed to their leadership. Team leadership of project teams was evident and documented in many grass root NGOs. Findings from the field indicated that NGOs with successful implementation of projects treated project leadership seriously. The importance of project leadership was also emphasized by the adjusted R-Square value which showed that project leadership accounts for a large percentage of the total variance in project implementation.

The findings also implied that project leadership style influenced project implementation by Grassroots NGOs in Kenya justifying the conclusion that project leadership style has a significant effect on project implementation by grass root NGOs in Kenya.

Accessibility of project leader for consultation of project issues was also found to influence project implementation significantly, just like extent of accountability of project leadership for training implied a big degree of influence as well.

Accountability of project leadership for effective project communications' influence in project implementation showed a very large influence of the factor in project implementation. The extent of accountability of project leadership for organizational resources was also a factor that proved to be of significant influence on project implementation.

Finally, Extent of accountability of project leadership for organizational culture was a factor that was of great influence in project implementation. The findings of this study are in tandem with Leting (2001) who conducted a case study on major factors that affect project management locally. He concluded that inexperienced project managers (project leadership), poor communication, poor monitoring and control systems negatively affected the project management efficiency.

V. CONCLUSION

The study concludes that Project Leadership affects project implementation and that project leadership style influenced project implementation by Grassroot Support NGOs in Kenya. In particular, the study is of the view that Democratic Leadership influences project implementation by providing leadership which impacts positively on the project implementation. Other aspects such as Accessibility and Accountability equally affect project implementation.

It is therefore recommended that organizations ought to strive to engage competent Project Leadership personnel in project implementation to ensure successful project implementation.

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Norbert W. Tietz: The Father of Modern Clinical Chemistry

Dr Biju C Mathew

Professor and Chairman

Department of Biochemistry and Industrial Microbiology

AJ College of Science and Technology, Thonakkal

Trivandrum, Kerala.

susanbiju_661@rediffmail.com

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Norbert W. Tietz (1926 – 2018)

On May 22nd 2018, Dr Norbert W. Tietz a towering personality and authority on clinical chemistry died in Atlanta, Georgia, USA at the age of 91. His demise marks the end of a remarkable professional career with seminal contributions as an educator, scientist, mentor and author in the areas of Clinical Chemistry and Laboratory Medicine. Born in Stettin, Germany in 1926, one of seven children, Dr Tietz received the degree of Doctor of Natural Sciences in 1950 from the Technical University in Stuttgart, Germany and was a research fellow from 1951 to 1954 at the University of Munich, working on the pathogenesis of atherosclerosis and related aspects of lipid metabolism. The aftermath of the World War II saw him face several hardships as a prisoner of war and refugee which forced him to immigrate to the United States in 1954 seeking for better opportunities. The travails are well documented in his autobiography, *My Life: From Refugee to Teacher & Scientist- Living the American Dream* (AACC Press 2010) which he dedicated to his Family, Colleagues, and Students.

In the same year Dr Tietz joined as a Research Fellow in Rockford Memorial Hospital, Illinois where he met noted clinical chemist Dr Samuel Natelson, an authority in developing newer laboratory techniques with forty nine patents to his credit. This association was a turning point in his professional career and developed in him a keen interest to pursue a career in clinical chemistry. It was during this period that saw the remarkable transformation of the clinical lab with the introduction of advanced technologies such as UV spectrophotometers, blood gas analyzers, flame photometers, electronic cell counters and automated blood chemistry analyzers. From an earlier passive role the clinical chemistry laboratory services started to emerge as an integral and vital component of medical care services. The utility of laboratory testing increased dramatically both in terms of the number and array of tests and also the precision with which they were being performed. Following a postdoctoral fellowship at the University of Chicago (1955-1956), he headed the Clinical Chemistry Laboratories at Reid Memorial Hospital, Richmond (1956-1959), and was Director of Clinical Chemistry, Mount Sinai Hospital, Chicago (1959-1976) for seventeen years. During this tenure he served as Professor of Clinical Chemistry and Biochemistry at Chicago Medical School and Rush Medical College. From 1976 to 1996 he was Professor of Pathology and Director of Clinical Chemistry at the University of Kentucky. In 1994 he served as a Visiting Professor (on sabbatical leave) in the Department of Pathology, University of California San Diego.

Dr. Tietz was a highly respected and revered teacher who took great efforts to highlight the importance of Clinical Chemistry in diagnosis and prognosis of diseases and its critical link to the practice of medicine. In the late 1960s he is credited to have started the first M.S degree and successive Ph.D. programs in Clinical Chemistry in the United States. The first International Conference on Clinical Enzymology (1972) and International Symposium on Clinical Enzymology (1976) was designed, organized and directed by him. It served as a global platform for scientists and experts to share their views on the topic and promote national and international efforts to standardize methods of enzyme assays and their reference ranges. He has published about 135 scientific articles on different aspects of clinical chemistry such as laboratory techniques, clinical enzymology, electrolyte analysis,

hydrogen ion homeostasis, and different organ function tests. As a gifted speaker and authority on the subject he has lectured in 18 countries, including the USSR, United Kingdom, The Peoples' Republic of China, Australia, New Zealand, and Singapore.

Among his many professional achievements the textbooks which he has written and edited are his greatest contributions to the field of clinical chemistry and allied sciences. Fundamentals of Clinical Chemistry which he wrote and first published in 1969, now in its eighth edition was the first modern textbook in clinical chemistry that linked and integrated the results of the laboratory, with basic medical subjects and finally its application to medical practice. The relationship of clinical chemistry with physiology, pathology and medicine is explained in a very lucid manner which is very informative to both the person performing the tests and the physician who treat the patient. Textbook of Clinical Chemistry was the next book which he edited and was published two years later. It is now in the sixth edition and is often referred to as the "Bible" of Clinical Chemistry and continues to be the standard reference textbook in the subject published in multiple languages. According to

Dr Nader Rifai, the present Chief Editor of the newly renamed Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, "Dr Tietz showed a keen interest and encouragement when he proposed to upgrade it from a book to a primary cloud-based platform to increase its accessibility to users via the internet". Dr Tietz also edited the Clinical Guide to laboratory tests, a handbook which served as a quick reference guide for use by practicing doctors, medical interns and students. He also served as editor for Clinical Chemistry sections of the Dictionary and Encyclopaedia of Laboratory Medicine and Technology. In his memoirs

Dr David N. Bailey, a colleague and personal friend of Dr Tietz and now Distinguished Professor of Pathology Emeritus, University of California, San Diego narrated an interesting incident which sheds light into the popularity of Dr Tietz as a dedicated teacher. 'On his sabbatical leave time in the Department of Pathology he taught the second year medical students topics in laboratory medicine, which focused on Clinical Chemistry. The medical students so revered him that, at the end of the course one year they presented him with a cake inscribed with "Thanks, Dr Tietz. You were well above the reference range!"

He has been conferred with several honors and awards including the Alwin Dublin Memorial Award, American Association of Clinical Chemistry Award for Outstanding Contributors to Clinical Chemistry and the Henry Wishinsky Distinguished International Services Award. In 1977 he served as President of American Association for Clinical Chemistry.

Dr Tietz is survived by his wife Gertrud and their children Margaret, Kurt, Annette, and Michael. His death is an irreplaceable loss to the entire academic fraternity especially those directly involved with the subject of Clinical Chemistry. As the Father of Modern Clinical Chemistry his contributions shall always remain within the reference range of our thoughts.

Acknowledgement:

The author expresses his deep gratitude to Dr David N. Bailey, Professor Emeritus, Department of Pathology, University of California, San Diego for his valuable inputs to prepare this article.

Electrochemical Characterization of Corrosion Behavior of Zinc in Different Sodium Chloride Solution by comparing Two Electrode and Three Electrode Setups

Shwe Wut Hmon Aye¹

¹West Yangon Technological University, Patheingyi-Nyaung Tone Street, Yangon, Myanmar

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Abstract- Zinc is highly reactive in all kinds of environments and has a natural tendency to form different types of corrosion products with different corrosion rates. Electrochemical studies typically use a conventional three-electrode setup to study the mechanisms and propose advanced corrosion models. However, for certain electrochemical applications a two-electrode configuration is more suitable. In particular, the analysis of atmospheric corrosion with microelectrodes under very thin electrolyte layers would benefit from such a configuration. In this investigation, a two-electrode configuration was compared with a conventional three-electrode cell to study the corrosion behavior of zinc.

The aim of this work is to evaluate the corrosion behavior of zinc and compare the two-electrode and three-electrode setups. The corrosion resistance was compared in different sodium chloride solutions (1 M, 0.1 M, 0.01 M, 0.001 M) using linear sweep voltammetry and electrochemical impedance spectroscopy.

The results reveal that the corrosion current is higher when the chloride concentration was increased in three-electrode setup. In the two-electrode system, the polarization curve is symmetric for the different concentrations. Furthermore, multisine measurement confirmed that corrosion current increased when the concentration increased. Using both electrode setups a clear evolution of the corrosion behavior of zinc with time is observed. The two-electrode setup gives similar impedance values, however only after taking into account the contributions of both electrodes.

Index Terms- Atmospheric corrosion, Zinc, Electrochemistry, Polarization curves

I. INTRODUCTION

Corrosion is the gradual degradation of a material by chemical and electrochemical reactions when a material is exposed to an aqueous or an atmospheric environment. Corrosion occurs because of the natural tendency of metals to react electrochemically with oxygen, water and alternative substances in the atmosphere. Most corrosion phenomena are of electrochemical nature and consist of at least two reactions occurring at the metal-electrolyte interface: the anodic and cathodic reactions. At the anodic electrolyte-metal interface, the metal is oxidized to form positively charged ions that go into solution or form solid compounds such as oxides.

This reaction releases electrons, which in turn, are consumed by one or several cathodic reactions at the cathodic electrolyte-metal interface.

Industrial outdoor exposure tests give general information related to the damage effect of the test material in a specific corrosion environment. These tests take too long to obtain rapid information on the corrosion of the material. Therefore, accelerated tests in controlled atmospheres are preferred. The most used test methods include salt spray tests [ISO 9227:2012]. Yet these tests still offer limited understanding of the underlying corrosion mechanism. In comparison, corrosion measurements in laboratories give wider information on the corrosion mechanism, since different corrosion environments can be tested and much more detailed measurement data can be obtained in well-controlled conditions. Hence, kinetic and mechanistic analysis can be performed in relatively short times. These analyses provide a good estimation of the materials behavior and can be used as starting point for designing corrosion models. However, most laboratory tests are performed under standard submerged conditions, which still differ from real (atmospheric) corrosion conditions.

To study the corrosion of materials, a number of electrochemistry techniques have been developed over the years. Especially linear sweep voltammetry, cyclic voltammetry, chronoamperometry and electrochemical impedance spectroscopy are widely used to characterize the electrochemical behavior of metals. The conventional setup consists of a potentiostat with a three-electrode cell. In a three-electrode cell the potential of the working electrode (WE) is controlled versus a reference electrode (RE) and the current flows between the working and a counter electrode (CE). Three-electrode configurations are designed so that the experimental data are totally determined by the chemistry of the working electrode [1]; in corrosion this is the studied material. The reference electrode should maintain a constant potential throughout the experiment. The function of the counter electrode is to provide a current of equal magnitude but opposite sign to that at the working electrode; the electron-transfer reaction at the counter electrode will be that which is easiest in the electrolyte solution.

Atmospheric corrosion is considered to take place on a metal surface covered with a thin layer of dilute electrolyte produced by condensation or adsorption [2]. Studies on atmospheric corrosion of metals under thin electrolyte layers have been carried out with dedicated experimental setups [3, 4,

5]. The electrochemical study of corrosion under these thin films is challenging; due to a limited electrolyte volume it is difficult to introduce all probes and electrodes. In this regard, the three-electrode setup is not the most suitable configuration in practice. That is the reason why in this study a two-electrode setup is tested and validated for the study of zinc corrosion. The basic configuration is used with one electrode as the working electrode and the second electrode connected to the reference and counter electrode inputs of the potentiostat.

Zinc and zinc alloys are used in many engineering applications. A main application is the galvanized coating on steel, which prevents oxygen and moisture from reaching the underlying metal and provides cathodic protection to the substrate. The corrosion behavior of zinc depends on the environmental conditions and electrolyte concentrations. The effect of corrosion can be either locally concentrated (pitting, crevice corrosion) or can be extended uniformly over a greater surface (uniform corrosion). The main factors affecting the corrosion rate and type of corrosion are the type of dissolved species, concentration, pH and temperature. They influence the structure and composition of the resulting films and corrosion products on the surface, which in turn control the corrosion process of zinc.

In the corrosion of zinc, Zn^{2+} ions are released from anodic areas and hydroxide ions are formed at cathodic areas due to the oxygen reduction. The precipitation products of the released ions can form a protective layer on the zinc surface in near neutral aqueous solutions under atmospheric conditions. This layer inhibits the corrosion reactions, providing a better corrosion resistance. In the overall process the anodic and cathodic reactions have to balance each other and thus the corrosion rate is limited by the diffusion of oxygen to the cathodic areas. This can be observed in the polarization curves, which show a limiting current during cathodic polarization.

The present study investigates the corrosion behavior of zinc in different sodium chloride solutions by using linear sweep voltammetry and odd-random phase multisine impedance spectroscopy (ORP-EIS) with a conventional three-electrode system and a two-electrode system. The aim of this work is to validate the two-electrode setup as a tool to evaluate corrosion mechanisms. This allows carrying out electrochemical studies in otherwise inaccessible geometries in applications such as microelectrodes, sensors, thin film analysis and batteries.

II. EXPERIMENTAL

A. Sample and solution preparation

The chemical composition of the zinc sheet is titanium 0.06 to 0.2% (weight percent), copper 0.08 to 1.0% (weight percent), aluminum 0.015% (weight percent) and balanced zinc. The thickness of the zinc sheet is 0.75 mm. First, the zinc sample was cleaned in an ultrasonic bath in ethanol for 30 minutes. Then the sample was washed several times with deionized water and dried at 60°C. A working surface of 5.08 cm² was left exposed, while the other areas were sealed with tape.

B. Electrochemical measurements

The linear sweep voltammetry measurements were carried out with potentiostat PGSTAT12 (Metrohm

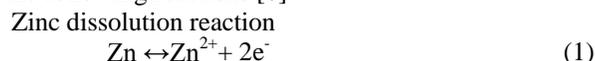
Autolab). The samples were polarized cathodically and anodically from 0 to ± 0.6 V versus the open circuit potential, in separated experiments, with a scan rate of 0.1 mV/s. The measurements were performed after one hour of immersion in sodium chloride. Odd random phase multisine impedance (ORP-EIS) [7] was measured with a Wenking potentiostat POS2 (Bank Elektronik) and a National Instruments PCI-4461 DAQ-card. The applied multisine signal is digitally composed with MATLAB R2010a software (Mathworks). MATLAB is also used for processing the collected data and controlling the DAQ-card. The frequency range analyzed was 0.01Hz to 10 kHz and the amplitude of the sinusoidal voltage signal applied, around the open circuit potential, was 3mV rms. The evolution of the corrosion behavior of the zinc plate was recorded with impedance measurements every 30 min for 24 h during constant immersion in the electrolyte. All experiments were conducted in aerated solution.

The data analysis provided by the ORP-EIS includes information about the noise level, the non-stationary behavior and the non-linear behavior [7]. This analysis verifies whether the impedance data have a good signal-to-noise ratio and whether the conditions of stationarity and linearity, necessary for correct experimental data [6], are fulfilled. The standard deviations on the excited and non-excited frequencies are compared to analyze the characteristics of the electrochemical system. The detailed description of the technique and the noise analysis can be found in [7].

For the conventional three-electrode setup, saturated silver-silver chloride electrode was used as the reference electrode, a platinum grid was used as the counter electrode and the zinc plate was the working electrode. For the two-electrode system, one zinc plate was the working electrode and a second (identically treated) zinc plate was the reference and counter electrode.

C. Chemical and electrochemical reactions

In this work, we only consider the reactions explained in this section. It is well known that the corrosion of zinc occurs through the following reactions [8]:



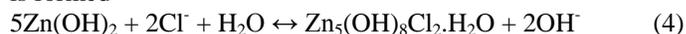
Oxygen reduction at the zinc surface according to the half-cell reaction



Reaction of the zinc cations and the hydroxide anions producing the zinc hydroxide



In the presence of sodium chloride, migration of the chloride ions (Cl^-) to anodic sites where zinc hydroxide chloride is formed



III. RESULTS AND DISCUSSIONS

To characterize the corrosion behavior of zinc, we used two electrochemical techniques; linear sweep voltammetry and multisine impedance. In this study, the corrosion behavior of zinc is characterized by studying the oxidation and reduction reactions. These are represented by zinc dissolution and oxygen reduction, respectively. The reduction of the dissolved oxygen is

limited by oxygen diffusion resulting in a limiting current during cathodic polarization.

A. Linear sweep voltammetry

Polarization curves for the three-electrode setup. Anodic and cathodic polarization curves were performed with the sample exposed to different concentrations of NaCl; 1 M, 0.1 M, 0.01 M and 0.001 M. Figure 1(a) shows the trend for the open circuit potential (OCP) or corrosion potential measured before both the anodic and cathodic polarizations. The OCP shifted to more negative values for higher concentrations. A lower OCP indicates that the metal is less resistant to corrosion. So, as expected, the corrosion resistance is lower for higher sodium chloride concentrations.

Figure 1(b) shows the changes in the polarization curve of zinc with different concentrations of sodium chloride. Since the OCP shifted for the different concentrations, the polarization curves are plotted as a function of the overpotential, which is the difference between the measured potential and the open circuit potential. The curves for positive overpotential (anodic polarization) and negative overpotential (cathodic polarization) are recorded separately.

Anodically, it is clear that the higher the concentration, the steeper the anodic polarization, which indicates strongly enhanced zinc oxidation. Cathodically, the kinetics are limiting and strongly influenced by the diffusion of oxygen to the metal-solution interface. At OCP, the reduction and oxidation currents are equal, so the overall corrosion current is equal to the cathodic limiting current density.

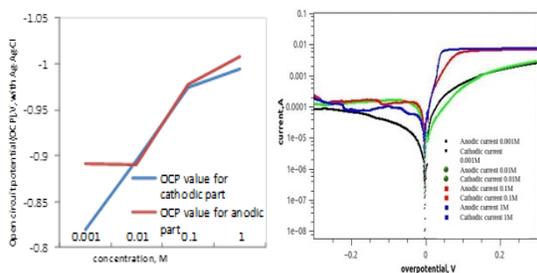


Figure 1. (a) Open circuit potentials for the different concentrations. (b) Cathodic and anodic polarization curves of zinc in different sodium chloride solutions with the three-electrode setup.

It is difficult to have a quantitative discussion on the limiting current for the oxygen reduction (Figure 1(b)), because of the fluctuations in the current. It can be seen that, generally in the potential range from 0 V to -0.2 V, the limiting current was decreased when the concentration was increased. This is due to the fact that the corrosion products block the metal surface, inhibiting oxygen diffusion. Therefore, the limiting current decreases. These results are in agreement with the paper by Yadav et al [9]. For very low chloride concentrations, the solution resistance is so high that the low current cannot be accounted to diffusion limitations. Instead, it is assigned to a high ohmic drop in solution. As a conclusion, the variation of the limiting current was not as high as expected; from the polarization curve we see that mainly the dissolution of zinc is influenced. This is attributed to a lower charge transfer resistance

due to dissolution of the oxide/hydroxide film on the zinc in chloride-enriched environments.

Polarization curves for the two-electrode setup. In the two-electrode setup (Figure 2), the anodic and cathodic polarization currents are symmetrical because the two electrodes are assumed to be identical. For every concentration, both anodic and cathodic regions show comparable current densities. Region I is the region of mixed kinetics between zinc oxidation and oxygen reduction. In this region, we observe the influence of the chloride concentration on the oxidation reaction; a higher slope in the exponential region is linked to higher sodium chloride concentrations. The same behavior was concluded from the polarization curves with the three-electrode system.

In regions II and III, the current is limited by the oxygen reduction reaction. We observe that with a higher sodium chloride concentration a higher limiting current is measured. This is counterintuitive because the saturation concentration and the diffusivity of oxygen decreases in more concentrated NaCl solutions and, therefore, the limiting current would diminish as well, according to the following equation:

$$i_{lim} = j_{lim} \times A = \frac{nFC_sD}{\delta} \times A, \quad (1)$$

where i_{lim} = limiting current (A), j_{lim} = limiting current density (A/m^2), C_s = concentration of dissolved oxygen (mol/m^3), n = number of exchanged electrons, $D = O_2$ diffusion coefficient (m^2/s), F = Faraday constant, 96485 C/mol, δ = diffusion layer thickness (m), A = electrode surface (m^2).

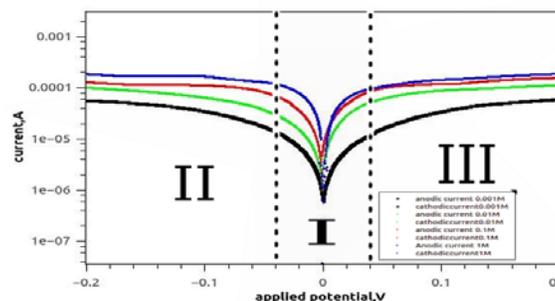


Figure 2. Cathodic and anodic currents for zinc in different sodium chloride solutions with the zinc-zinc two-electrode setup.

A possible explanation of the increase of the limiting current is the increase of the working electrode surface area due to zinc deposition. Although the overall reaction is limited by oxygen reduction, the counter reaction is the oxidation of the second zinc electrode, which brings Zn^{2+} ions in the solution. This means that oxygen reduction is no longer the only reaction in the cathodic part. Oxygen reduction and zinc deposition take place together, at the negatively polarized electrode. With higher NaCl concentrations, more metal of the counter electrode is dissolved, hence the concentration of Zn^{2+} ions is higher and more Zn would be deposited on the working electrode. Due to zinc deposition, the active surface increases; this may increase the limiting current, according to equation (1).

In summary, from both setups it can be concluded that at the initial stages the zinc oxidation reaction is more favored when the concentration is increased. However, the limiting current in the cathodic polarization (corresponding to the oxygen reduction) did not show the expected behavior. Still, similar trends were observed in the kinetic region (close to OCP) of the

cathodic side with both electrode configurations. That confirms the possibility to use the two-electrode cell for kinetic corrosion studies.

B. Impedance spectroscopy

Impedance spectroscopy is a method to study the electrochemistry around the corrosion potential, without having to polarize the sample. With this technique we could eliminate the effect of zinc deposition in the two-electrode configurations.

The corrosion of Zn in NaCl was also investigated with both electrode setups using ORP-EIS. The impedance spectroscopy measurements were performed every 30 min during 24h. There is a clear evolution of the corrosion behavior of the zinc sample during the measurement time, as it can be seen for the Bode plots of the impedance in Figure 3. Over time the modulus of the impedance lowers and the phase curve also reduces and its minimum shifts to lower frequencies, but they seem to stabilize in the last measurements.

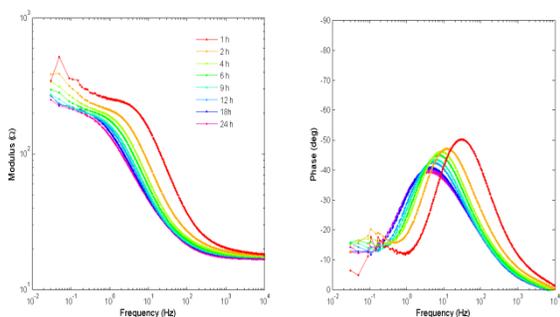


Figure 3. Bode plots of the impedance of zinc in 0.01 M NaCl with the two-electrode cell during 24 h immersion. (a) Modulus. (b) Phase angle.

Zinc presents distinct impedance responses for the different concentrations of NaCl, as shown in Figure 4 for the two-electrode cell. The lower the concentration of the electrolyte, the less attacked the metal and the higher its impedance (Figure 4(a)) and the more the phase minimum shifts to lower frequencies (Figure 4(b)). It is interesting to point out the different magnitude of the impedance at high frequencies for the different solutions, which corresponds to the resistance of the solution: as expected its value diminishes with a higher concentration of electrolyte. A similar trend of the impedance is observed with the three-electrode setup.

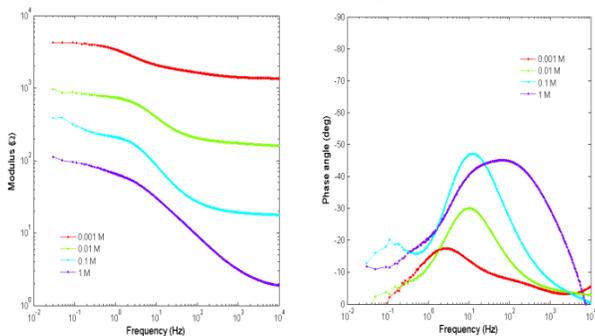


Figure 4. Bode plots of the impedance of zinc in different concentrations of NaCl with the two-electrode cell after 2 h immersion. (a) Modulus. (b) Phase angle.

One of the main advantages of the ORP-EIS technique is the analysis of the linearity and stationary of the

electrochemical impedance. To simplify the interpretation of the noise analysis, three curves are presented together with the impedance measurements, as it is illustrated in Figure 5. If the curves of ‘noise + non-stationarities’ and ‘noise level’ overlap, the system is stationary, i.e., time-invariant. If the curves of ‘noise + non-linearities’ and ‘noise level’ coincide, the system behaves linearly. In Figure 5(a), for the impedance after 2 h, the noise curves do not fall together, therefore, the electrochemical system is time-variant and non-linear; although the non-linearities can be misinterpreted because of the high level of non-stationarities (3 orders of magnitude higher than the noise). Yet, the impedance after 12 h is stationary and linear, as seen in Figure 5(b). These results show that the zinc corrosion is more time-variant in the first experiments and it varies less with time for longer immersion times. This confirms the behavior observed in the sequence of consecutive measured impedance (Figure 3).

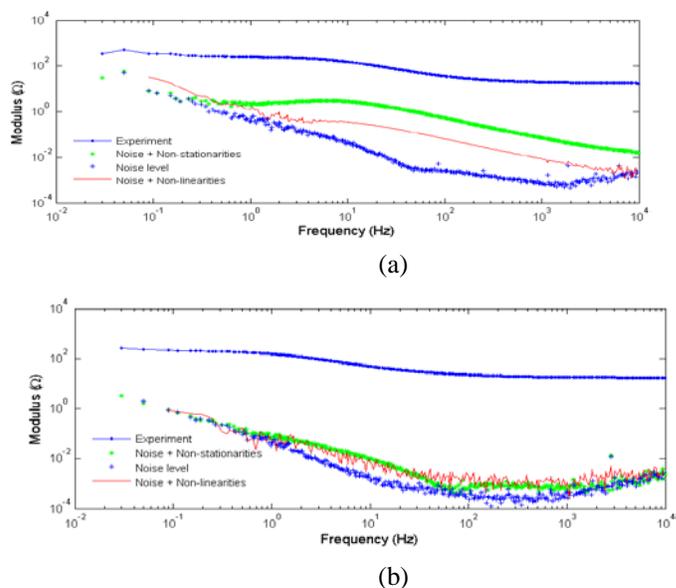
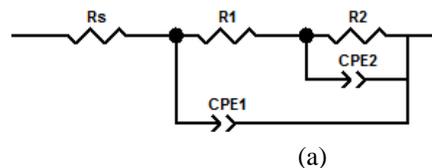


Figure 5. Analysis of the linearity and the stationarity of the impedance measurements of zinc in 0.01 M NaCl with the two-electrode cell: (a) after 2 h; (b) after 12 h.

To better understand the corrosion of the zinc, the impedance data were modeled with the electrical equivalent circuits (EEC) displayed in Figure 6, in which R_s is the resistance of the solution, R_1 is the charge transfer resistance, CPE_1 is the constant phase element corresponding to the double layer, R_2 is the resistance of the oxide layer formed, CPE_2 is the constant phase element corresponding to the oxide layer and W is the Warburg impedance caused by the diffusion of species from/towards the electrode/electrolyte interface [2, 10]. The inclusion of the Warburg element (Figure 6 (b)) was needed to model the impedance of zinc in the more concentrated solutions, 1 M and 0.1 M. For the lower concentrations, 0.01 M and 0.001 M; the circuit in Figure 6 (a) was used.



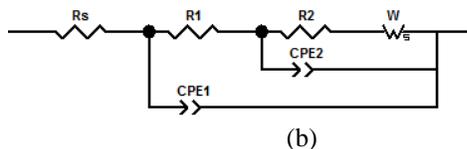


Figure 6. Electrical equivalent circuits used to model the impedance experiments.

The double layer and oxide layer capacitances are, therefore, modeled with a CPE that accounts for the imperfections of the surface. The impedance of the CPE is formulated as a function of the frequency f with the Q and α parameters according to $Z_{CPE} = 1/[Q \cdot (j \cdot 2\pi f)^\alpha]$.

The evolution of the parameters for the 24 h immersion in 0.01M NaCl can be seen in Table 1. It is clear that R_1 increases, which indicates that the metal is more resistant to corrosion. R_2 first increases slightly but after 9 h starts to decrease, that is, the resistance of the oxide layer becomes less resistant.

Table 1. Estimated parameters of the EEC for the impedance of zinc in 0.01 M NaCl during 24 h with the two-electrode configuration; all parameter errors are below 15%.

time (h)	R_1 (Ω)	R_2 (Ω)
2	44	619
4	90	660
6	106	677
9	113	684
12	150	675
15	210	616
18	258	553
21	320	435
24	350	381

The impedance data of zinc in different sodium chloride concentrations were also modeled. The calculated resistances of the double layer and the oxide layer after 15 h immersion are displayed in Table 2. In agreement with the trend observed in Figure 4, the resistances of both the double layer and the oxide layer are lower with higher concentrations of NaCl.

Table 2. Estimated resistances for the impedance of zinc in different concentrations of NaCl after 15 h immersion using the two-electrode cell; all parameter errors are below 15%.

[NaCl] (M)	R_1 (Ω)	R_2 (Ω)
1	15	97
0.1	35	166
0.01	210	616
0.001	242	1840

Regarding the impedance measured with each of the electrode configurations, it was observed that the impedance using two electrodes was always higher than the one with the three-electrode cell. This can be easily seen in the modulus of the impedance shown in Figure 7.

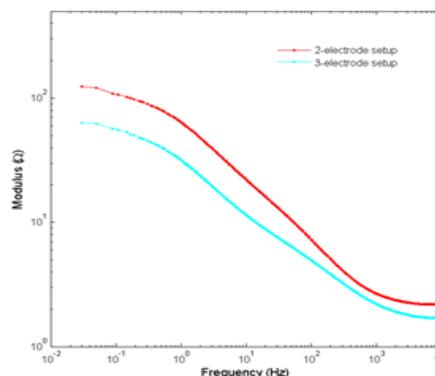


Figure 7. Modulus of the impedance of zinc in 1 M NaCl after 15 h immersion using the two-electrode and three-electrode setups.

This observation is due to the contribution of the CE/electrolyte interface, which cannot be neglected using two identical electrodes. In EIS experiments the total impedance of the circuit WE-CE is measured, that is, the contributions from both electrodes are recorded together. In a conventional three-electrode setup, the CE has a significantly higher surface area than the WE, therefore, its impedance is very low and the total impedance is dominated by the one on the WE. Thus, the only contributions observed with the conventional cell are the electrolyte resistance and the impedance of the WE/electrolyte interface. However, for the two-electrode configuration used in this work, both electrodes have the same area, hence, the impedances on the CE and WE contribute similarly to the total impedance. Since the WE and CE are in a serial circuit, the impedance recorded is the sum of the impedances on both electrodes. This is confirmed with the values of the estimated resistances R_1 and R_2 , which are 1.8-2.3 times higher with the two-electrode cell than with the three-electrode cell.

The two-electrode setup in combination with electrochemical impedance spectroscopy represents an appropriate tool to measure and model electrochemical systems. However, with identical counter and working electrodes, special consideration is required to obtain the proper impedance values. The measured impedance should be corrected to take into account the doubled impedance of the WE/CE system. One practical way is by expressing the impedance per unit area, considering the sum of the areas of the two electrodes.

IV. CONCLUSIONS

Both two-electrode and three-electrode setups show that the oxidation reaction of zinc is more favored with higher NaCl concentrations during the initial stages of corrosion. A similar trend is observed with impedance and polarization techniques. The limiting currents for oxygen reduction are higher with higher concentrations of sodium chloride. Although this is counterintuitive, this effect has been assigned to the deposition of zinc ions. These ions are produced at the zinc counter electrode, after deposition they enlarge the surface area of the working electrode, which results in a higher limiting current. With multisine impedance, higher impedances are measured with lower electrolyte concentrations, showing that the metal is more resistant to corrosion. The same trend is obtained with the two and three-electrode setups. With both electrode setups, the

corrosion of zinc is more time-variant in the first experiments and it varies less with time after several hours of immersion.

When using the two-electrode setup with impedance spectroscopy, the areas of both the working and counter electrodes should be taken into account to calculate the impedance per unit area. Following the conclusions above, the two-electrode setup is validated for the study of the corrosion behavior of materials in inaccessible geometries for applications such as microelectrodes, sensors, thin film analysis and batteries.

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AUTHOR

Author – **Shwe Wut Hmon Aye**, Professor and Head,
Department of Metallurgical Engineering and Materials Science,
West Yangon Technological University, hmon152@gmail.com.

Performance Appraisal Policy (Theory And Practice)

Abdijabbar Ismail Nor

Lecturer, Faculty of Economics and Management Science, Somali National University, Somalia

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1. INTRODUCTION

This policy is designed to provide an appropriate, clear, and consistent framework for the assessment of employees' performance within the context of work improvement, self-evaluation and development planning. It ensures that managers fairly and equitably review the performance of their employees and ensures that each employee is delivering high quality service to stakeholders, and is treating colleagues with dignity and respect. It also provides supervisors with an effective tool to evaluate their employees' work performance and also to help employees to improve their work performance. It also gives employees an opportunity to get feedback concerns and areas of potential.

2. PURPOSE

The Main objective of this policy is to ensure that the organizations have a clear, consistent and fair approach to appraisal. Performance appraisal is aimed to:

1. Acknowledge good performance.
2. Evaluate the performance of employees in any organization.
3. Improve employees' performance.
4. Decide performance expectations/requirements and discuss them with the employees.
5. Determine if performance expectations/requirements are being met and how well they have been met.
6. Set objectives for the year ahead.
7. Encourage staff development.
8. Objectively document employees' performance.
9. Inform employees of any performance strengths and weaknesses.
10. Serve as a consideration in making promotional decisions.
11. Inform employees are accountable for the quality and outcomes of their work.

3. SCOPE

This policy applies to all employees employed by the organizations

4. ROLES AND RESPONSIBILITIES IN THE COORDINATION OF THE PERFORMANCE APPRAISAL PROCESS

4.1. *Individuals /Appraisees*

Individual employees are responsible for:

- 4.1.1. Their own performance and ensuring that they understand expectations in relation to work objectives and ongoing work responsibilities for their role.
- 4.1.2. Actively participate in the performance and review process by preparing for the appraisal discussion, contributing to their personal appraisal development plan and actively applying newly acquired knowledge and skills within the role.
- 4.1.3. Self-assessment of their achievements and progress against objectives.
- 4.1.4. Agreeing a Personal Development Plan (PDP) with their appraisers.

4.2. *Line Managers / Appraisers*

Line managers are responsible for:

- 4.2.1. Ensuring that each member of staff has an individual appraisal at least once every year.
- 4.2.2. Ensuring that each member of staff has an up to date job description and person specification.

- 4.2.3. Ensuring that each member of staff has an up to date performance appraisal manual.
- 4.2.4. Ensuring that appraisers have the necessary training, skills and information to carry out an appraisal discussion.
- 4.2.5. Informing HR Department of the date of when an appraisal discussion has taken place so that the staff member's electronic staff record (ESR) is up-to-date and accurate.
- 4.2.6. Ensuring the formal appraisal documentation, store a copy in the staff member's personal file held by the line manager and provide a copy to the appraisee.
- 4.2.7. Ensuring meaningful objectives are set which support overall organizational objectives.
- 4.2.8. Agreeing an annual performance development plane (PDP) with all employees and providing support to meet that plan.
- 4.2.9. Providing regular feedback on achievement and progress required to ensure continuous development.
- 4.2.10. Ensuring that all employees have an equal access to the development opportunities.
- 4.2.11. Recording the Performance Appraisal on the Manual Staff Record (MSR) or Electronic Staff Record (ESR).

4.3. Human Resources Department

Human Resources department is responsible for:

- 4.3.1 Providing guidance on the application of the Performance Appraisal policy.
- 4.3.2 Providing appraisal advice, support and training to managers/appraisers.
- 4.3.3 Helping managers to identify and overcome the barriers to performance appraisal.

5. PERFORMANCE APPRAISAL PROCESS

The appraisers should follow this performance appraisal process which consists of:

5.1. Setting the performance standards

Organizations should first develop performance standards and measures to be used as a benchmark to compare actual performance of the employees. This step requires setting the performance criteria to judge performance of the employees as successful or unsuccessful of the degrees. The standards set should be clear, easily understandable and measurable terms.

5.2. Communicating the standards

The standards should also be communicated to the parties involved in performance appraisal: such as: appraiser and appraisee. Appraiser is one who does the appraisal and the appraisee is the one whose performance is evaluated. The appraisees should be informed to the standards to help them understand their roles and to know what exactly is expected from them. The standards should also be communicated to the appraisers or the evaluators as performance measures. Communicating the standards to the involved parties helps the organizations to modify the standards based on the relevant feedback from the employees or the evaluators or both.

5.3. Measuring the actual performance

After setting the performance standards and communicating them to the involved parties, the third step is to measure the actual performance which is the most difficult part of the performance appraisal process. For example, the work done by the employees during a specified period of time is a continuous process which involves monitoring the performance throughout the year. This stage requires careful selection of the appropriate techniques of measurement such as personal observation, statistical reports, and written reports for measuring the performance.

5.4. Comparing actual performance with performance standards

At this stage, actual performance is compared with the desired performance or performance standards. Comparison reveals deviations in the performance of the employees from set standards. This comparison can show actual performance is better than the desired performance or, actual performance is less than the desired performance or equals. At this stage, organizations reveal whether there is deviation in the performance of the employees (gap).

5.5. Providing feedback

When the actual performance is compared with the desired performance or performance standards, the results of the comparison should be communicated and discussed with the employees on one-to-one- basis. The focus of the discussion is on communication and listening. The results, problems and possible solutions should be discussed, with the aim of problem solving and reaching consensus and motivate the employees to perform better.

5.6. Taking corrective actions

After comparing the actual performance with the desired performance or performance standards, and showing the gap, then, the corrective actions such as training and developments, demotions, transfers etc. should be taken when the actual performance is less than the desired performance to overcome the deficiencies or to take decisions related to HR practices like rewards, promotions, if the actual performance is equal or better than the desired performance.

6. CONFIDENTIALITY

The whole performance appraisal information including objectives and evaluation of performance will be treated with strict confidentiality at all times. Performance appraisal information will only be shared with authorized bodies.

7. DOCUMENTATION AND RECORD KEEPING

1. Annual Performance Appraisal and Development Reviews should be recorded by the Managers to meet local needs or confirm the appraisal discussions and outcome by writing a letter as long as the following areas are documented:
 - a) Performance and progress on objectives for the previous year.
 - b) Agreed objectives for the coming year.
 - c) Feedback in relation to the values and behaviors.
 - d) Agreed development.
2. The appraiser and appraisee should each keep a copy of the completed documentation.
3. The record is kept on a confidential personnel file in HR Department
4. The record should be used as reference for the implementation of the agreed actions and for consideration of progress at the next review.
5. Performance appraisal information should be retained for a minimum period of years either on the employees personnel file or on the HR system.

8. MONITORING

1. HR Department should monitor and evaluate performance appraisal records and related data to ensure policy compliance.
2. HR department is responsible for auditing performance appraisal policies, practices, and processes to ensure that employees working throughout the organizations have a functional and compliant performance appraisal system.

9. POLICY REVIEW

Performance Appraisal policy should be reviewed on an annual basis.

10. SAMPLE OF STAFF PERFORMANCE APPRAISAL FORM

This part gives the readers and policy makers a sample of staff performance appraisal form which consists of seven sections including: personal information of the employee, the overall performance rating of supervisor in conducting performance appraisal, Performance Factors or performance measures, the comments of both employee and supervisor and finally, the signature of both employee and the Rater/Supervisor.

SECTION 1: PERSONAL INFORMATION

Name of Appraisee	
Position /job title	
Section/Department	
Date of Employment	/ / /
Period under Review	From / / / To / / /
Type of appraisal	Annual <input type="checkbox"/> Semiannual <input type="checkbox"/> probationary <input type="checkbox"/>

SECTION 2: DEFINITIONS OF OVERALL PERFORMANCE RATING

Substantially exceeds job requirements	Exceeds job requirements	Meets job Requirements	Partially meets job requirements	Does not meet most job requirements
5()	4()	3()	2()	1()

SECTION 3: PERFORMANCE APPRAISALS

Instructions:

Please carefully review the employee’s performance during the appraisal period and select the description that best describes the employee’s overall performance.

Performance Factors	Rating levels (√)				
Attendance	5 ()	4()	3()	2()	1()
• punctuality	5 ()	4()	3()	2()	1()
• Absence	5 ()	4()	3()	2()	1()
• Tardiness	5 ()	4()	3()	2()	1()
• late coming	5 ()	4()	3()	2()	1()
• early leave	5 ()	4()	3()	2()	1()
Average score for this section:					
Comments					
Competency	5 ()	4()	3()	2()	1()
• knowledge	5 ()	4()	3()	2()	1()
• Skills	5 ()	4()	3()	2()	1()
• Experience	5 ()	4()	3()	2()	1()
Average score for this section:					
Comments:					
Initiative and motivation	5 ()	4()	3()	2()	1()
• Independent	5 ()	4()	3()	2()	1()
• Resourcefulness	5 ()	4()	3()	2()	1()
• Highly motivating	5 ()	4()	3()	2()	1()
Team work and Relationship with others	5 ()	4()	3()	2()	1()
• Attitude towards others	5 ()	4 ()	3 ()	2 ()	1 ()
• Works with others to achieve desired results	5 ()	4 ()	3 ()	2 ()	1 ()
• Conflict prevention	5 ()	4 ()	3 ()	2 ()	1 ()
• And resolution	5 ()	4 ()	3 ()	2 ()	1 ()
• Flexibility					
• Respect					

Average score for this section:					
Comments:					
General Character	5 ()	4()	3()	2()	1()
• Ethics	5 ()	4()	3()	2()	1()
• Conduct	5 ()	4()	3()	2()	1()
• Core Values	5 ()	4()	3()	2()	1()
Average score for this section:					
Comments:					
Communication	5 ()	4 ()	3()	2()	1 ()
• Skill and Clarity	5 ()	4 ()	3 ()	2 ()	1 ()
• Interpersonal Characteristics	5 ()	4 ()	3 ()	2 ()	1 ()
• Listening skills	5 ()	4 ()	3 ()	2 ()	1 ()
• Oral and written skills	5 ()	4 ()	3 ()	2 ()	1 ()
Average score for this section:					
Comments:					
Professionalism	5 ()	4()	3()	2()	1()
• Appearance	5 ()	4()	3()	2()	1()
• personal standards	5 ()	4()	3()	2()	1()
• Confidentiality	5 ()	4()	3()	2()	1()
• Self-control	5 ()	4()	3()	2()	1()
Average score for this section:					
Comments:					
Leadership and/or Management	5 ()	4()	3()	2()	1()
• Planning	5 ()	4()	3()	2()	1()
• Organizing	5 ()	4()	3()	2()	1()
• Directing	5 ()	4()	3()	2()	1()
• Controlling	5 ()	4()	3()	2()	1()
• Execution	5 ()	4()	3()	2()	1()
• Innovation	5 ()	4()	3()	2()	1()
• Style	5 ()	4()	3()	2()	1()
• Managing Changes	5 ()	4()	3()	2()	1()
Average score for this section:					
Comments:					
Discipline	5() No disciplinary record, follows the orders and policies	4() No disciplinary record	3() Less than 2 times of disciplinary record	2() 2 times of disciplinary record	1() More than 2 times of disciplinary record

SECTION 4: OVERALL PERFORMANCE RATING FOR THIS APPRAISAL PERIOD

Supervisor, based on your overall review, check the performance rating level of this employee’s performance:

Substantially exceeds job requirements	Exceeds job Requirements	Meets job Requirements	Partially meets job requirements	Does not meet most job requirements
5() <input type="checkbox"/>	4() <input type="checkbox"/>	3() <input type="checkbox"/>	2() <input type="checkbox"/>	1() <input type="checkbox"/>

SECTION 5: EMPLOYEE COMMENTS

This section provides an opportunity for the employee to give comments regarding his/her performance.

Comments:

SECTION 6: SUPERVISOR COMMENTS

This section provides an opportunity for the supervisor and/or the next level supervisor to give comments regarding the employee’s performance.

Comments

SECTION 7: SIGNATURES

<p>Employee Name Date Signature NB (Signature acknowledges receipt, not necessarily agreement):</p>	
<p>Rater/Supervisor Name : Date: Signature :</p>	<p>Next Level Supervisor/Dept. Mgr. Name : Date: Signature</p>

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Author: Abdijabbar Ismail Nor
Lecturer, Faculty of Economics and Management Science
Somali National University, Somalia
Email: abdijabbar57@gmail.com

Algorithm for congestion control network in vehicular ADHOC network

Ankit Kumar

M.Tech. Scholar, Oriental University, Indore

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ABSTRACT

I propose a scattered, supportive message activity blockage control and spread figuring 'CCMDA' utilizing ITS that effects fruitful utilization of correspondence to channel, keeps up zone protection, more secure voyaging and air condition and gives drivers unfaltering data on improvement deters over long segments. Advancement articles ought to encourage with each other by utilizing vehicle-to-Infrastructure (V2I) and Vehicle-to-vehicle (V2V) correspondence approaches, as the correspondence data is the best unutilized thoroughly factor in ITS for diminishing message activity blockages in correspondence channel (CCH), sparing travel time, decreasing heap up, lessening air contaminations, lowering centrality utilize and in addition giving requesting data amidst improvements. What's more, we demonstrate an adaptable reenactment and acknowledgment structure we masterminded and made to support our framework by showing its achievability in different conditions and to help in the imaginative work of this and future VANET applications.

The vital motivation driving this check diminish the car crashes and street trafficking by the stop up control assuming that can guarantee high steadiness and ideal transport of disseminating occasion driven security messages to one focus point to different focus focuses.

In this suggestion we proposed a thought L-Routes, message transmissions obey remarkable structures and they are required to help for execution of stop up control updates. L-Route is a predefined course to dissipate data autos and furthermore transports fustily. Thusly, L-Routes ought to have a capacity to join more adaptable focuses with the target that procedure can be best utilized. This course satisfying grant messages quick one focus point to different focus focuses.

KEYWORDS

VANET, Networking, CCMDA, Congestion, L-Route, Broadcasting.

INTRODUCTION

The postulation modifies the present obstruct control to the remote condition that is a tiny bit at a time transforming into an essential portion of the vehicular uncommonly designated framework. Today transportation prosperity is a champion among the most basic employments of vehicular frameworks. Vehicles can pass on information on action, road accidents, road trafficking and road conditions with each other, and moreover with settled framework center points (RSU). The dispersal of emergency messages to all vehicles is a basic issue in surge hour gridlock circumstances, for instance, for events if there ought to emerge an event of accident the spread of security messages may foresee assistant mishaps and expect an essential part in the ensure of people. It is in this way essential to ensure a strong telecom of alert and ready messages, with low movement delay. This prosperity message is called event driven message.

We have taken a based paper in this paper proposed a TMDA calculation and in this paper, novel Vehicle Ad-hoc Network (VANET) working for city activity correspondences is shown. This structure will make an open gateway for examination of the upsides of auto based procurement and spread of improvement data and in addition age and hovered execution of development control. For planning purposes, the structure applies another Traffic Message Delivery Algorithm (TMDA).[1] But in this paper there is no portray the degree of vehicles for correspondence we have enhanced the blockage control issue and proposed the CCMDA calculation, given the favored outcome over TMDA.

In the surge hour gridlock zone, contrasting and variable correspondence solicitations and development issues can happen at whatever point. In this way, most extraordinary and perfect information are depended upon to be joined into correspondence traditions by many research and exercises. Despite the way that there has not been any thorough and standard message transport

figuring meeting the necessities yet, a couple of researchers have proposed computations with the thought of particular development information, for example, the fuse of the assertions into the intermittent signs for high reliability [2] and the thought of vehicles' status and enveloping information in [3], et cetera.

This work bases on the change of a system for obstruct control issues: Congestion Control Message Delivery Algorithm (CCMDA) is a novel development controlling computation expected for improving correspondence execution of a particular VANET orchestrate. The qualification when appeared differently in relation to another controlling tradition is that CCMDA does not simply complete single telecom approach, for instance, the essential flooding, probability based procedure, area based system and neighborhoods-based start [4], yet furthermore gets astute coordinating techniques by utilizing the past movement information for message transport at any given moment and describe the locale of the vehicles for pass on messages one vehicle to another.

In this proposition we use L-Route for scattering messages one concentration point to another center. It recommends that the figuring with the blend of headway course information will be introduced in each correspondence flexibility center point with current actuated information change contraptions and give advance courses to messages between the source and the objective.

Stop up control counts are planned to find zones of high action thickness and low speeds. Each vehicle spreads the information it has gotten from its own particular gear and from various sources and process the information got from various centers in the framework.

Blockage control is only a solitary of various employments of ITS and it isn't proposed to be used as means for automated driving yet rather as a mechanical assembly to pass on information to the driver that will support him/her settle on decisions to avoid the growing development issues, for instance, auto deluge and snappy mishap notification et cetera. Fast and reliable consistent action information is vital device to collect ensured and capable development condition. To achieve this goal, action things should organize with each other by using Car-to-Infrastructure (C2I) and Car-to-Car (C2C) correspondence approaches, as the correspondence of information is the best unutilized totally factor in ITS for reducing development blockages, saving travel time, decreasing car crash, improving air defilements, lowering imperativeness usage and moreover giving asking for information in the midst of developments.

PROPOSED SOLUTION

We proposed game plans that describe the extent of vehicles in which high need messages would be send from source center point to objective centers and we prescribe a L-Route in highway. This is a fundamental course, e.g. transport ways, used to choose next exercises of center points. Rapidly, if messages accomplish L-Routes, they will be speedier sent after the pre-composed headings of the L-Routes; else, they rely upon made telecom approaches in a manner of speaking.

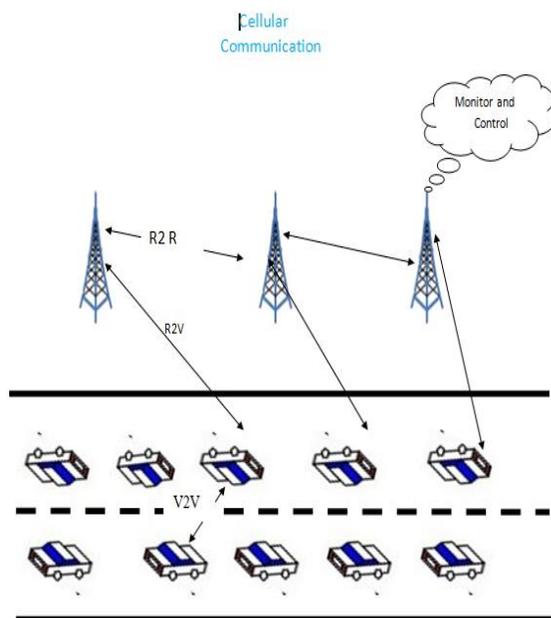


Fig: 1 Vehicle to Infrastructure and Vehicle-to-Vehicle Communication

TRAFFIC CONGESTION CONTROL

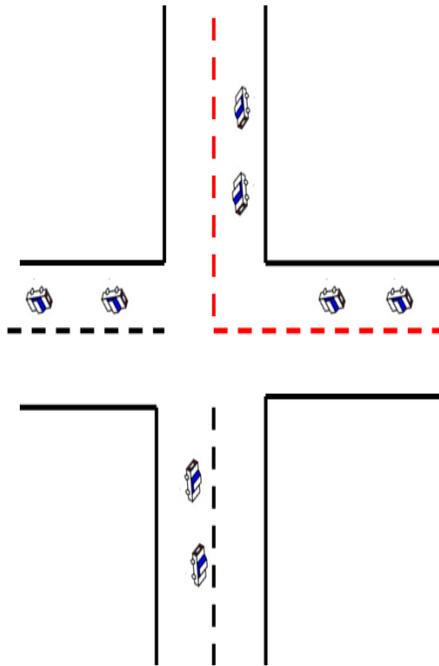


Fig: 2 Show the traffic in High-Way in L-Route.

PROPOSED ALGORITHM

PSEUDO CODE OF CCMDA IN BROADCASTING MESSAGES

- STEP 1:** Event: Define the range between Ps and Pd
- STEP 2:** Finding the position of Pd, we calculate the T(avg.)
- STEP 3:** $T(\text{avg.}) = (T_{d1} + T_{d2} + T_{d3} + \dots + T_{dn}) / n$
- STEP 4:** If $(T_{ack} < T_{avg})$ then
- STEP 5:** Add the node in the node list;
- STEP 6:** else
- STEP 7:** discard the node;
- STEP 8:** Event: the message received by the Pd
- STEP 9:** on the off chance that msg_id isn't in check_list at that point
- STEP 10:** gets the message;
- STEP 11:** else

- STEP 12:** dispose of the message;
- STEP 13:** Occasion: the message got from Neighbouror Ps
- STEP 14:** if $R = sr$ then
- STEP 15:** discard the msg;
- STEP 16:** else
- STEP 17:** if $P_d = dst$ then
- STEP 18:** inform others to stop broadcasting;
- STEP 19:** else
- STEP 20:** if Ps is on L-Routes then
- STEP 21:** if Pd is on L-Routes then
- STEP 22:** when $T_c = T_{d1}$, farthest neighbor forward message;
- STEP 23:** Inform others between $\langle Ps \text{ to } Pd \rangle$ to stop broadcast;
- STEP 24:** Message is put away longer in this hub Pd;
- STEP 25:** else
- STEP 26:** if Direction of Pd= Direction of S then
- STEP 27:** when $T_c = T_{d2}$, farthest neighbor forward message;
- STEP 28:** else
- STEP 29:** when $T_c = T_{d3}$, farthest neighbor forward message;
- STEP 30:** else
- STEP 31:** if Pdis on L-Routes then
- STEP 32:** when $T_c = T_{d1}$, farthest neighbor forward message;
- STEP 33:** inform others between $\langle Ps \text{ to } Pd \rangle$ to stop broadcast;
- STEP 34:** message is stored longer in this node Pd;
- STEP 35:** else
- STEP 36:** when $T_c = T_{d1}$, farthest neighbor forward message;

CCMDA OVERVIEW

Congestion Control Message Delivery Algorithm (CCMDA) is a novel change control figuring proposed for upgrading correspondence execution of a particular VANET build. The refinement when meandered from another coordinating tradition is that CCMDA does not simply execute single telecom

approach, for instance, the fundamental flooding, probability based framework, and neighborhood-based begin, yet close to gets portray the level of vehicles, precarious sorting out procedures by utilizing the earlier change information for message transport at any given moment. In this figuring proposed the segment to keep up a key detachment from blockage issue in VANET. The computation with the possibility of action course information will be embedded in each correspondence .

Flexibility focus point with current pushed data change contraptions and give streamlining courses to messages between the source and the target fixation centers. CCMDA uses highlights of every sort of focus focuses for fit and solid development correspondences. For instance, it doesn't just manhandle articulation of auto focus focuses, yet additionally mishandle the advantages of controllable, booked, and predicted transport focuses; it doesn't just permit clear telecom practices of vehicles, yet besides make occupations of higher limit of transport focus focuses for really anchoring and sending the messages. Regardless, these messages will be send predefine L-Routes and depict the degree of vehicles.

ALGORITHM DETAILS

CCMDA could be confined into two segments: (a) depict the degree of vehicles, and (b) getting of messages. In first locale portray the degree of vehicles for finding the situation of focus of target. We take in the T_{avg} by the run of the mill of timing to take the time achieved messages of various focus focuses eg. There are $(1, 2, \dots, n)$ focuses and the time of achieved messages for various focuses are $(T_{d1}, T_{d2}, \dots, T_{dn})$. To discover T_{avg} to take the aggregate of time of messages came to various focus focuses and restricted by the aggregate no. of focus focuses 'n' $T_{avg} = (T_{d1} + T_{d2} + T_{d3} + \dots + T_{dn})/n$.

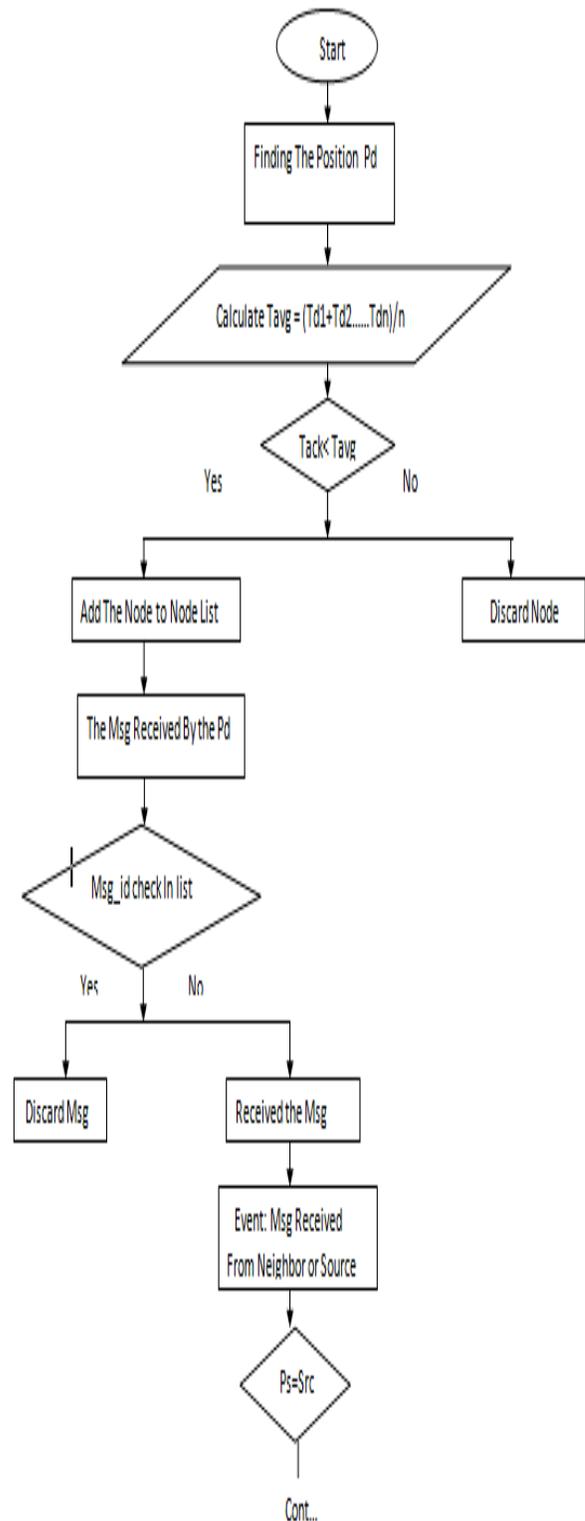
Calculation displaying the pseudo-code of CCMDA for message enduring part. `Actually, above advances understand a specific sending instrument by using extra roadway improvement related data. The general point is to address grant storm issues. Two basic parts are connected with the structure. One is the probability of L-Route. This is a basic course, e.g., transport routes, used to pick next activities of focuses. On the off chance that messages achieve L-Routes, they will be speedier sent after the pre-laid out heading of the L-Routes; else, they depend upon made telecom structures as they say. The inside focuses on L-Route, notwithstanding the true blue kind, are overseen as transports. In perspective of L-Route, another contemplation is about 'most evacuated focus point at first sends' (FNFS). Once a sender passes on a message to all neighbors, the most remote one inside the transmission range will manage the message following

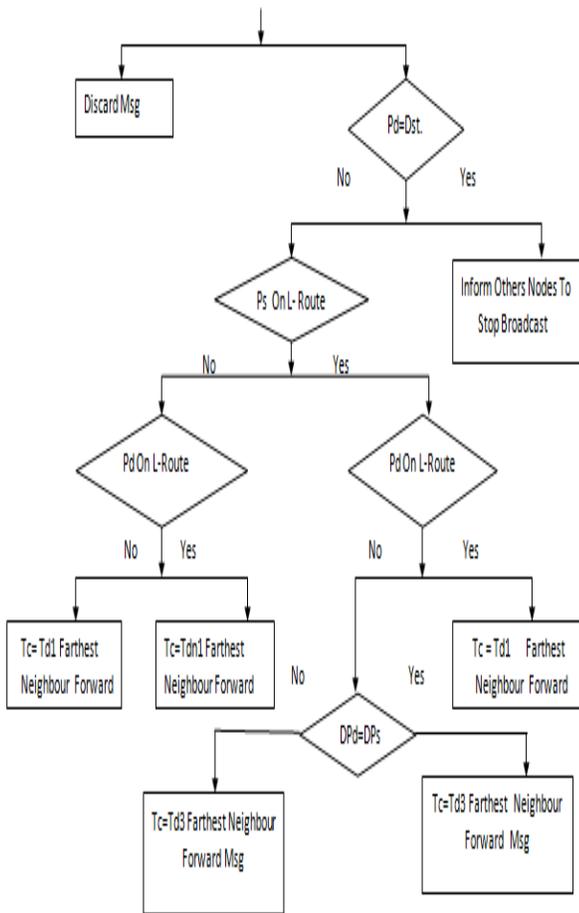
the need over others. The need level is set by delays presented in the running with pseudo-code of CCMDA. The thought is gainful to control information impacts to a specific degree. Message enduring point of confinement is separated into two occasions. From line 8 to 13, when a beneficiary Pd gets a message with the id msg_id , Pd should promptly check whether it gets an excess message. Each VANET focus has a $check_list$ to store got msg_id . Along these lines if the msg_id is found in the quick overview, Pd disposes of the message; generally, proceeds with the strategies for another occasion (line 14 to 36). When Pd gets the message from its neighbors or source Ps, it needs to ensure that the message does not float back. By at that point if Pd is the target focus point, it fundamentally gives back to all neighbors with a stop run the show. Obviously, if Pd is a broadly engaging focus just, strides from line 13 to line 29 depend on. To judge when to forward the message to neighbors, Pd has to know neighbor's or Ps' position (x, y) and its own particular position. This checks whether they are on L-Routes or not. On the off chance that both of Ps and Pd are on L-Routes, by then Pd moves the message at T_{d1} which includes current time (T_c) and a holding up delay d_1 . Inside the transmission go, the $delay_{d1}$ will be decreased running with the augmentation of separation between $\langle Ps, Pd \rangle$. That is, the most remote Pd will forward message at first. Additionally, if Ps is on the L-Route in any case Pd isn't, the moving headings of Pd and Ps end up fundamental. Same course of Pd and Ps $(D_r = D_s)$ impacts the forward to happen at T_{d2} while the message is bestowed at T_{d3} for various introduction of Pd and Ps. The estimation of T_{d2} or T_{d3} is uncommon yet both contain a present time T_c , a deferral as shown by the separation d_1 and a pre-coordinated postponement d_2 setup by the figuring. The respect arrange is $T_{d1} < T_{d2} < T_{d3}$.

THE FLOW-CHART OF PROPOSED CCMDA ALGORITHM

The CCMDA count delineate through flowchart which given underneath in flowchart first we find out the circumstance of center point of objective 'Pd'. Position of Pd Calculate T_{avg} and check the estimation of this is more significant than T_{ack} . In the occasion that T_{ack} isn't precisely to T_{avg} by then incorporate the center in center rundown for the most part discard the center point. The message gotten by the Pd by then message id check under tight limitations list if no then discard the messages for the most part gets the messages. Message got from neighbors or source by then condition apply Ps is proportional to source if yes by then discard the message for the most part Pd is objective if yes by then light up others centers stop convey the information. Here we consider the new idea of L-Route, this course predefine

to information broadcasting in which the blockage issue would not be happen and the message forward fast to another courses. In case P_s on L-Route if yes by then check position of P_d on L-Route if yes then current time T_{d1} , the message forward to the most remote center point first and no check the heading of P_d and P_s if they same course then T_c is equal to T_{d2} most far off neighbour forward message for the most part T_c is equal to T_{d3} most remote neighbour forward message first. Check the circumstance of P_d on L-Route if yes then T_c is identical to T_{d1} most remote neighbour forward message first if this accomplished by then stop impart the message source to objective for the most part.





Flow-Chart of Proposed CCMDA Algorithm

RESULTS EVALUATION AND ANALYSIS

System correspondence execution examinations in perspective of two parameters one is end-to-end put off time (EDT) and another is message development rate (MDR).

- >End-to-End Delay Time (EDT)

It proposes the term of a message sent from source to objective over the system.

- >Message Delivery Rate (MDR)

It tends to a degree of great message transports source focus point to target focus.

THE COMPARISON OF ROUTING PROTOCOLS AODV
Remote Ad hoc On-Demand Distance Vector (AODV) organizing custom weights on versatile remarkably named

structures (e.g., MANETs) these days. It is a responsive controlling convention which influences a course for focuses precisely when they to request it, being one of standard telecom organizing customs utilized beginning at now for both unicast and multicast planning. The basic issue is the telecom storm, which attempts to be maintained a strategic distance from and lessened in the proposed coordinating custom CCMDA.

TMDA

Movement Message Delivery Algorithm passes on messages depending upon the possibility of pre-organized courses (I-Routes) in the city circumstances.

CCMDA

Traffic Control Message Delivery Algorithm passes on messages depending upon the possibility of pre-planned courses (L-Routes) in the high - way circumstances. In light of general telecom methodologies, CCMDA diminishes convey whirlwinds and stop up issue in orchestrate by methods for particular sending framework, joined with geographic information.

RESULT IN VARIOUS DENSE NETWORK

Following figure examine EDT and MDR results by applying Congestion Control Message Delivery Algorithm (CCMDA), executing Ad hoc On-Demand Distance Vector (AODV) and Traffic Message Delivery Algorithm (TMDA) coordinating tradition in low, medium and high thickness of frameworks autonomously. There is a supposition in the examinations that the proliferation length 40 seconds and unpredictable source-to-objective sets are allowed to exchange distinctive measure of messages (from 1 to 10) in low ,(from 1 to 50) in medium and (from 1 to 100) in high thickness orchestrate. The general point is to investigate whether CCMDA prompts less EDT and higher MDR in various circumstances rather than an another present controlling tradition; how degree the measure of messages influence on correspondence execution; and how the example of EDT and MDR changes in different framework conditions eg. low thickness orchestrate, medium thickness framework and high thickness compose.

LOW DENSITY NETWORK

Figure consider typical deferral of messages and ordinary rate of messages, results by applying Congestion Control Message Delivery Algorithm (CCMDA), Traffic Message Delivery Algorithm (TMDA) and On-Demand Distance Vector (AODV) coordinating tradition in low thickness organize. According to the diagrams CCMDA shows humblest deferral from 1 message to 10 messages for each testing time.

So it is evidently show up in outlines low ordinary deferral and high typical rate of CCMDA better than AODV and TMDA in low-thickness medium.

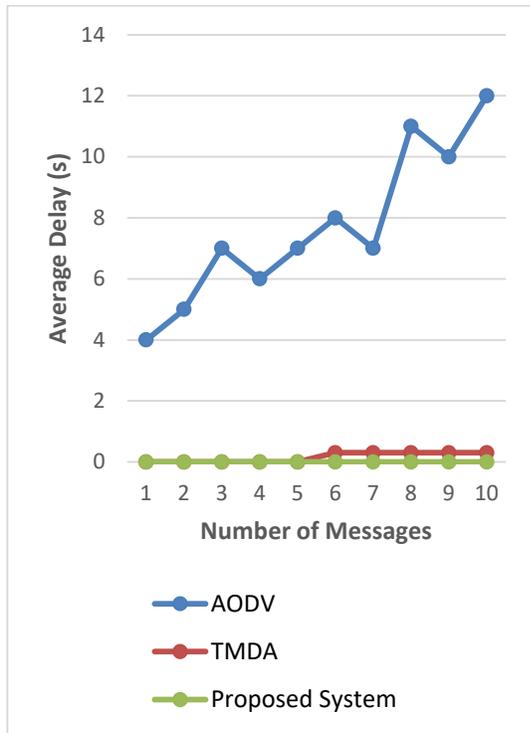


Fig: 1 Delays in the low density of networks

So it is clearly show up in graphs low ordinary deferment and high typical rate of CCMDA better than AODV and TMDA in medium thickness medium.

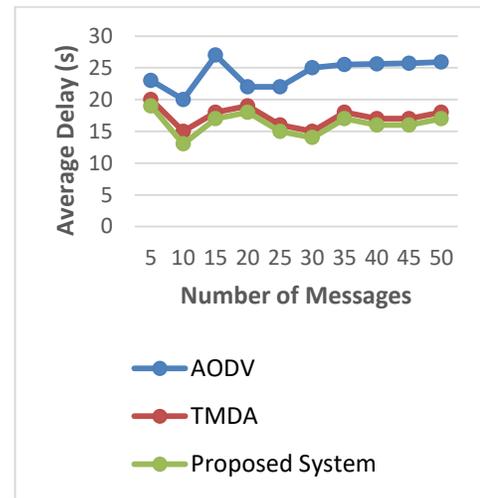


Fig: 1 Average delays in medium density network

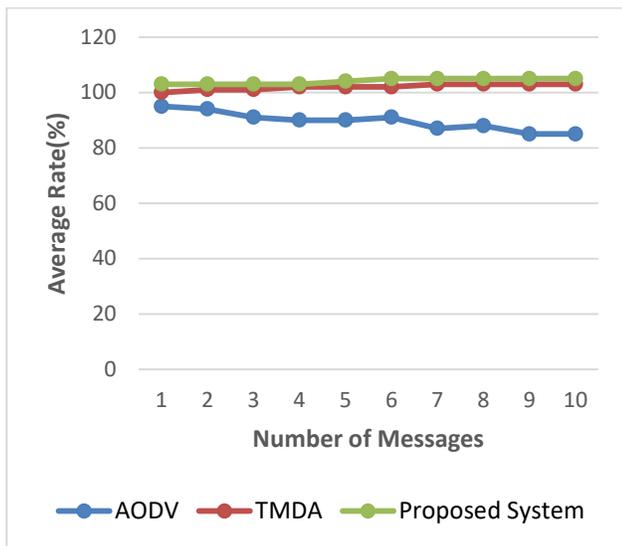


Fig: 2 Rates in the low density networks

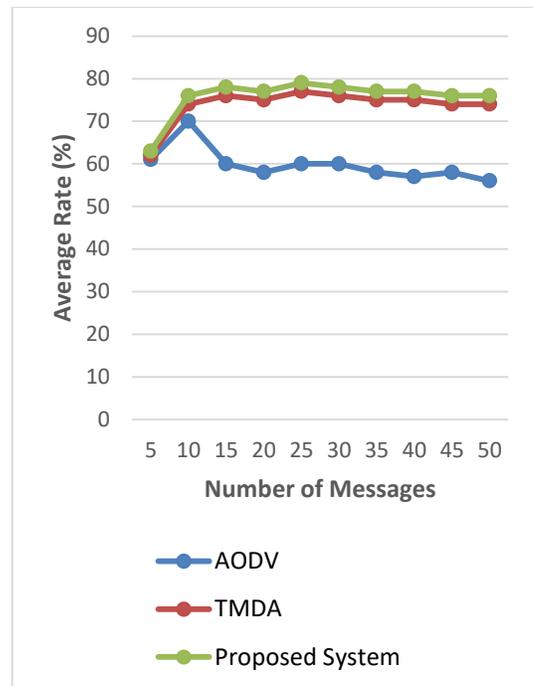


Fig: 2 Average Rates in medium density networks

MEDIUM DENSITY NETWORK

Following figure consider typical delay of messages and ordinary rate of messages, results by applying Congestion Control Message Delivery Algorithm (CCMDA), Traffic Message Delivery Algorithm (TMDA) and On-Demand Distance Vector (AODV) coordinating tradition in medium thickness mastermind. According to the charts CCMDA shows humblest deferral from 1 message to 50 messages for each testing time.

HIGH DENSITY NETWORK

Following figure take a gander at ordinary deferral of messages and typical rate of messages, results by applying Congestion Control Message Delivery Algorithm (CCMDA), Traffic Message Delivery Algorithm (TMDA) and On-Demand Distance Vector (AODV) controlling tradition in medium thickness organize. As shown by the outlines CCMDA indicates humblest

delay from 1 message to 100 messages for each testing time, contemplating the thunders lines typical deferral and most lifted ordinary rate from the above lines than got from TMDA and AODV traditions.

So it is evidently show up in outlines low typical deferral and high ordinary rate of CCMDA better than AODV and TMDA in high thickness medium.

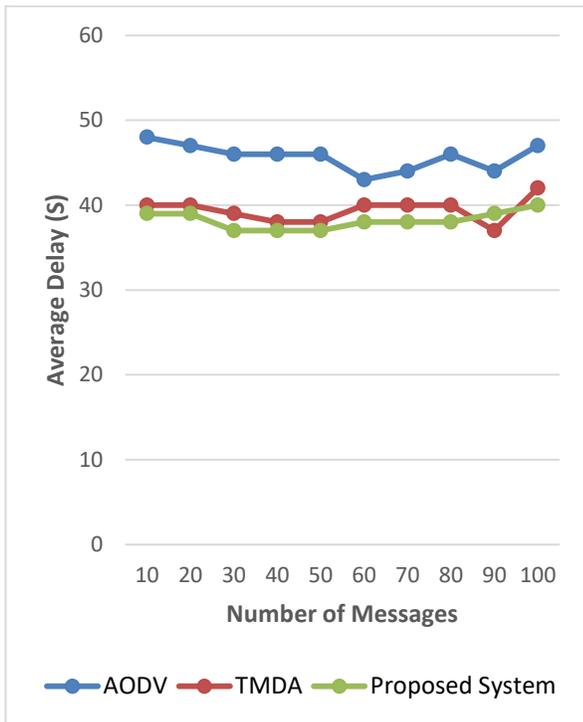


Fig: 1 Average delays in the high density medium

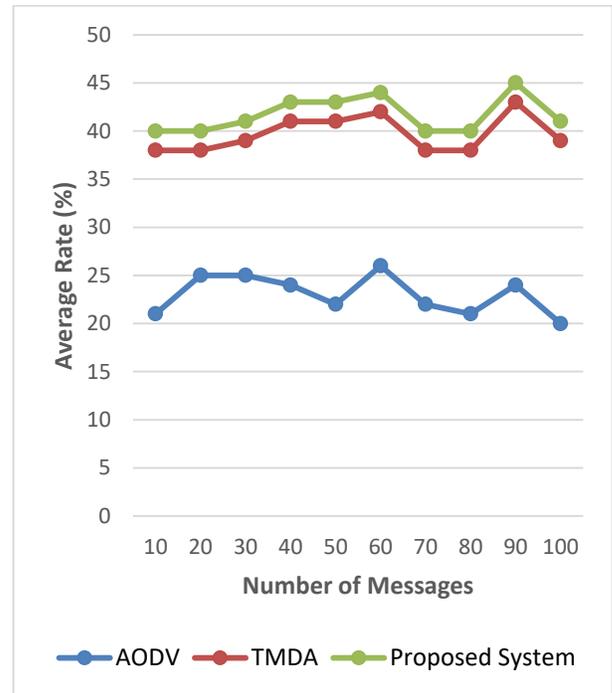


Fig: 2 Average Rates in the high density network

CONCLUSION

This report tended to the relationship of correspondence execution of normal deferral and run of the mill rate of messages by utilizing proposed figuring and indisputable organizing customs (AODV and TMDA) in a novel VANET layout. AODV and TMDA are coursed convention utilized typically in without any preparation system, while, CCMDA is a starting late proposed and enhanced of TMDA calculation. It not just gets measures in context of existing telecom figuring yet additionally high-way activity course data into the tally, using the likelihood of 'L-Route' open in vehicles and high-way. The motivation behind these new controlling techniques is to help the effect of the issues caused by past planning conventions and in addition best association for the specific utilizes foundation. We plan a VANET diagram, which contains two sorts of interestingly assigned correspondence objects – flexible (autos), and static (street side units) ones.

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Study of Nuclear Structure of $^{24,26}\text{Na}$ isotopes by using USDB interaction

Ali .K. Hasan¹ and Azhar.N.Rahim²

Department of Physics, College of Education for Girls, University of Kufa, Iraq
alikh.alsinayyid@uokufa.edu.iq¹ and AzharNathem1992@gmail.com²

Abstract:

In this article, we assess the accuracy of theoretical shell model in calculating the excited states of Sodium isotopes $^{24,26}\text{Na}$ on the basis of recently reported experimental results. The assessments rely on the calculations of the energy levels, reduced electric quadrupole transition probabilities $B(E2)$ and reduced magnetic dipole transition probabilities $B(M1)$ are based on OXBASH shell model code by applying USDB interaction. Applying the program for above isotopes using the defined codes introduces several files which each file contains a set of data. Mean while the ground state of excitation energy evaluated by OXBASH code together with energy levels and reduced electric quadrupole transition probability $B(E2)$ and Magnetic dipole transition probability $B(M1)$ and also probable places for nucleons' placements in each energy level. A compilation of SD-shell energy levels calculated with the USD Hamiltonian and has been published around 1988. A comparison had been made between our results and the available experimental data to test theoretical shell model description of nuclear structure in Sodium isotopes. The calculated energy spectrum is in good agreement with the available experimental data.

1.Introduction:

Obtaining the nuclear structure and energy levels of nuclei is one of the criteria to improve investigations of nuclei properties. Nuclear models have the property to help us to better understanding of nuclear structure which contains main physical properties of nuclei, and shell-model is one of the most prominent and successful nuclear models. This model can be compared with the electron shell model for atoms. As atomic behavior and properties can be described with valence electrons which exist out of a closed shell, similarly, valence nucleons (protons or neutrons) in a nucleus which are placed out of close shells (with magic numbers 2,8,20,28,50,82 and 126) play important roles in determining nuclear properties. Nuclei with magic numbers are very stable and have completely different properties comparing with their neighbors[1].The nuclear shell model has been very successful in our understanding of nuclear structure: once a suitable effective interaction is found, the shell model can predict various observables accurately and systematically. For light nuclei, there are several "standard" effective interactions such as the Cohen- Kurath and the USD interactions for the p and SD shells, respectively. Analysis of neutron-rich SD nuclei has been of intense curiosity in recent years as they present new aspects of nuclear structure [2].Traditional shell-model studies have recently received a renewed interest through large scale shell-model computing in no-core calculations for light nuclei .Because of the quite importance of the $(0d_{5/2}, 1s_{1/2}, 0d_{3/2})$ space for variety of problems in nuclear structure, this space is a region where the shell model can play an indispensable role and is at the frontier of our computational abilities[3].The shell model calculations of the neutron-rich Sodium isotopes have been developed using the OXBASH code[4].

2.Theory:

The nuclear shell model, introduced almost 50 years ago by Mayer Haxel, Jensen, and Suess, has been very successful in describing the properties of nuclei with few valence nucleons[5]. These properties include the energy levels, magnetic and quadrupole moments, electromagnetic transition probabilities, beta decay, and cross section for various reactions. The basic assumption of the nuclear shell model is that, to a first approximation each nucleon moves independently in a potential that represents the average interaction with the other nucleons in a nucleus. The complete Schrodinger equation for A nucleons reads as [6].

In the realistic shell model, we have to take into account (H) this part of the nuclear Hamiltonian that was omitted in the mean-field description. Nucleon configurations are mixed by this residual interaction. Interactions between nucleons make them jump from one orbital to another with conserve (T, J^π) , so that the wave function contains several configurations. So, we should solve the eigenvalues problem[7].

$$H|\Psi_i\rangle = E_i|\Psi_i\rangle$$

Configuration mixing leads to the wave functions to consist of more than just one Slater determinant. So, we are looking for the wave function of the system in the form.

$$|\Psi_i\rangle = \sum_{k=1}^n a_{ki}|\Phi_k\rangle \quad , i = 1, 2, \dots, n$$

where g the number of pure configurations considered and it is related to the valance space used, and a_k is amplitude(weight) the wave function $|\Phi_k\rangle$. Usually, the valance space incorporates all possible configurations of valance protons and valance neutrons in the partially filled orbitals, while the rest is considered as an inert core (usually, we take a double magic numbers). So we treat only the valance nucleons. This theory efficient for few numbers of valance nucleons (smaller than five valance nucleons). It is clear that the valance space becomes quickly huge for numerical treatment as the number of valance nucleons increases [8].

There are many programs that implement the calculations of the shell model, which differ in their methods of calculation as well as the language in which they were built, and differ in the systems that work on them and their speed in the completion of calculations, including OXBASH. And to run the calculations of the shell model using OXBASH. It was necessary to know how to install the program and how to operate it to ensure the accuracy of calculations and results. In order to calculate the nuclear structure properties of both ground and excited states based on the nuclear shell model one needs to have wave functions of those states. These wave functions are obtained by using the shell-model code OXBASH [9]. OXBASH (Oxford- Buenos Aires Shell Model Code) is a powerful computer code to calculate the energy levels, reduced electric quadrupole transition probabilities $B(E2)$ and Magnetic quadrilateral transition probability $B(M1)$ of light and medium nuclei. By using it, we can measure the energy levels of the nucleus and compare it with experimental data as well [10].

3. Shell model calculations:

The calculations have been conducted using the code OXBASH for Windows. The code uses an m-scheme Slater determinant basis. Using a projection technique, wave functions with good angular momentum J and isospin T are constructed. The effective interactions of the USDB Hamiltonians with SD model space. The SD model spaces consists of $0d_{5/2}$, $1s_{1/2}$, and $0d_{3/2}$ above the $Z = 8$ and $N = 8$ closed shells for protons and neutrons, respectively. single-particle energies (SPEs) for every Hamiltonian used in this work (MeV). Use in this work USDB interaction and single-particle energies (SPEs) are $\{0d_{5/2}=-3.926, 1s_{1/2}=-3.208$ and $0d_{3/2}=2.112\}$ respectively [11].

4. Results and Discussion:

Shell model calculations for low lying energy states of $^{24,26}\text{Na}$ isotopes have been performed for the space model ($0d_{5/2}$, $1s_{1/2}$, and $0d_{3/2}$) with neutrons ($N=13$ and 15) above the ^{16}O close core for above isotopes. The calculations are based on the Universal (sd-shell) Hamiltonian (USDB). we have used the OXBASH code in both m-scheme and jj-coupling. The object of this present study is to calculate energy levels and reduced electric quadrupole transition probabilities $B(E2)$ and Magnetic quadrilateral transition probability $B(M1)$ by employing harmonic oscillator potential (HO, b), $b < 0$ all isotopes. The effects of core polarization have been taken into account in the calculations by effective charges of both protons and neutrons.

4.1 Energy Levels:

4.1.1. ^{24}Na nucleus:

According to the shell model, the ground state of ^{24}Na nucleus is a closed ^{16}O core with eight nucleons distributed as three protons and five neutron in sd space, which is similar for other Na isotopes ($13 \leq N \leq 11$) for the closed core and proton distribution. Excited states are formed by the configuration of these nucleons in the sd-shell model space. Table (1) show the comparison between theoretical and available experimental data of ^{24}Na nucleus [12] by using the USDB interaction.

From the down table both USDB Hamiltonians agree reasonable well with empirical data compared with the ^{24}Na energy levels with the experimental values. The ground state was confirmed 4_1^+ . The agreement is good for the states of with empirical values. $J^\pi = 1_1^+, 2_1^+, 2_2^+, 1_2^+, 5_1^+, 2_3^+, 3_2^+, 3_4^+, 4_2^+, 4_2^+, 1_3^+, 1_4^+, 3_5^+$ and 2_8^+ as compared with the experimental data, respectively. The $J^\pi = 1_6^+$,

$1_7^+, 1_8^+$ and 0_5^+ levels confirmed as positive parity. This study also confirmed the $J^\pi = (2_4^+), (4_3^+), (2_5^+)$ and 2_6^+ levels with the calculated energies (2.787, 3.001, 3.604 and 4.045) MeV, respectively. The levels of for which the angular momentum and parity are yet unknown $J^\pi = 3_3^+, 1_5^+, 5_4^+, 2_7^+, 2_9^+, 7_1^+, 6_2^+, 0_2^+, 4_8^+, 1_9^+, 5_7^+, 4_{10}^+, 6_6^+, 5_8^+, 7_2^+, 5_9^+, 5_{10}^+, 6_7^+, 7_3^+, 6_8^+, 7_4^+, 8_1^+, 0_6^+, 8_2^+, 7_6^+, 7_7^+, 8_3^+, 8_4^+, 9_1^+, 8_6^+, 9_2^+$ and 8_7^+ , respectively. New energy levels were predicted at the states ($J^\pi = 8_8^+, 9_4^+, 8_9^+, 10_2^+, 9_5^+, 8_{10}^+, 9_6^+, 9_7^+, 9_8^+, 10_3^+, 10_4^+, 11_1^+, 9_9^+, 9_{10}^+, 10_5^+, 10_6^+, 11_2^+, 10_7^+, 10_8^+, 10_9^+, 11_3^+, 10_{10}^+, 11_4^+, 11_5^+, 12_1^+, 11_6^+, 11_7^+, 11_8^+, 11_9^+, 12_2^+, 11_{10}^+$ and 12_3^+).

Table 1: Comparison of the experimental excitation energies[13] and excitation energies predictions for ^{24}Na nucleus by using USDB interactions

J^π (OXBASH)	Energy (OXBASH) USDA (MeV)	Energy (exp.) (MeV)	J^π (exp.)
4_1^+	0.000	0.000	4+
1_1^+	0.540	0.472	1+
2_1^+	0.629	0.563	2+
2_2^+	1.107	1.341	2+
3_1^+	1.338	1.344	(3)+
1_2^+	1.324	1.346	1+
5_1^+	1.546	1.512	5+
2_3^+	1.807	1.846	2+
3_2^+	1.803	1.885	3+
3_3^+	2.348	1.960	-----
3_4^+	2.627	2.513	3+
4_2^+	2.649	2.562	4+
2_4^+	2.787	2.977	(2+, 3+)
4_3^+	3.001	3.216	(4+, 2+)
1_3^+	3.346	3.413	1+
1_4^+	3.621	3.589	1+
3_5^+	3.459	3.628	3+
2_5^+	3.604	3.655	(2+, 1+)
0_1^+	3.527	-----	-----
4_4^+	3.707	-----	-----
5_2^+	3.860	-----	-----
6_1^+	4.003	-----	-----
3_6^+	3.844	3.936	-----
5_3^+	4.112	-----	-----
2_6^+	4.045	3.977	(1-, 2+)
1_5^+	4.366	4.220	-----
3_7^+	4.679	4.526	3-
4_6^+	4.721	4.690	-----
5_4^+	4.782	4.772	-----
5_5^+	4.897	-----	-----
3_8^+	4.781	-----	-----
2_7^+	4.908	4.891	-----
2_8^+	5.020	5.031	2+, 3, 4+
1_6^+	4.816	5.045	(1, 2, 3)-
2_9^+	5.323	5.180	-----
7_1^+	5.313	5.308	-----
1_7^+	5.184	5.397	(1, 3)-
6_2^+	5.399	5.408	-----
4_7^+	5.340	-----	-----
6_2^+	5.659	5.479	1-
0_2^+	5.567	5.571	-----
6_3^+	5.556	5.585	-----
0_3^+	5.820	5.720	-----
4_8^+	5.979	5.896	-----
3_{10}^+	5.904	5.918	1-, 3+
6_4^+	6.530	-----	-----
5_6^+	5.995	5.953	-----
4_9^+	6.234	-----	-----

1 ₉ ⁺	6.192	6.183	-----
5 ₇ ⁺	6.139	6.222	-----
1 ₁₀ ⁺	6.724	-----	-----
6 ₅ ⁺	6.794	-----	-----
4 ₁₀ ⁺	6.586	6.578	-----
6 ₆ ⁺	7.442	6.715	-----
5 ₈ ⁺	6.638	6.787	-----
0 ₄ ⁺	6.770	-----	-----
7 ₂ ⁺	6.695	6.846	-----
5 ₉ ⁺	7.236	7.090	-----
0 ₅ ⁺	7.103	7.085	0-
5 ₁₀ ⁺	7.483	7.324	-----
6 ₇ ⁺	7.442	7.433	-----
7 ₃ ⁺	7.497	7.511	-----
6 ₈ ⁺	7.826	7.708	-----
7 ₄ ⁺	7.843	7.832	-----
7 ₅ ⁺	8.565	-----	-----
8 ₁ ⁺	8.482	8.390	-----
0 ₆ ⁺	8.554	8.610	-----
6 ₉ ⁺	8.722	8.860	-----
8 ₂ ⁺	8.772	-----	-----
7 ₆ ⁺	9.008	-----	-----
7 ₇ ⁺	9.022	-----	-----
6 ₁₀ ⁺	9.065	-----	-----
0 ₇ ⁺	9.094	9.280	-----
8 ₃ ⁺	9.870	9.630	-----
7 ₈ ⁺	10.031	-----	-----
0 ₈ ⁺	10.360	-----	-----
7 ₉ ⁺	10.342	-----	-----
0 ₉ ⁺	10.519	-----	-----
8 ₄ ⁺	10.724	-----	-----
7 ₁₀ ⁺	10.583	-----	-----
8 ₅ ⁺	10.966	-----	-----
0 ₁₀ ⁺	10.845	-----	-----
8 ₆ ⁺	11.762	11.610	-----
9 ₁ ⁺	12.185	12.190	-----
9 ₂ ⁺	12.953	11.900	-----
9 ₃ ⁺	13.396	-----	-----
8 ₇ ⁺	12.592	12.540	-----
8 ₈ ⁺	12.611	-----	-----
9 ₄ ⁺	14.097	-----	-----
8 ₉ ⁺	12.997	-----	-----
10 ₂ ⁺	16.507	-----	-----
9 ₅ ⁺	14.606	-----	-----
8 ₁₀ ⁺	13.207	-----	-----
9 ₆ ⁺	14.097	-----	-----
9 ₇ ⁺	14.870	-----	-----
9 ₈ ⁺	15.161	-----	-----
10 ₃ ⁺	15.014	-----	-----
10 ₄ ⁺	16.092	-----	-----
11 ₁ ⁺	17.019	-----	-----
9 ₉ ⁺	15.161	-----	-----
9 ₁₀ ⁺	15.748	-----	-----
10 ₅ ⁺	17.375	-----	-----
10 ₆ ⁺	17.577	-----	-----
11 ₂ ⁺	18.461	-----	-----
10 ₇ ⁺	18.136	-----	-----
10 ₈ ⁺	18.485	-----	-----
10 ₉ ⁺	19.287	-----	-----
11 ₃ ⁺	19.372	-----	-----

10 ₁₀ ⁺	19.482	-----	-----
11 ₄ ⁺	20.540	-----	-----
11 ₅ ⁺	21.396	-----	-----
12 ₁ ⁺	22.031	-----	-----
11 ₆ ⁺	22.675	-----	-----
11 ₇ ⁺	23.884	-----	-----
11 ₈ ⁺	24.330	-----	-----
11 ₉ ⁺	24.577	-----	-----
12 ₂ ⁺	25.057	-----	-----
11 ₁₀ ⁺	25.211	-----	-----
12 ₃ ⁺	29.988	-----	-----

4.1.2. ²⁶Na nucleus:

The ground state of ²⁶Na nucleus is a close ¹⁶O core plus six nucleons distributed as three protons and three neutron in sd space at 0d_{5/2}, 1s_{1/2}, and 0d_{3/2} configurations. At table (2) show the comparison between theoretical and available experimental data of Na¹⁶ nucleus[12] by using the USDB interaction.

From the Down table both USDB Hamiltonians agree reasonable well with empirical data compared with the ²⁶Na energy levels with the experimental values. The ground state was confirmed 3₁⁺. The agreement is good for the states of with empirical values. J^π=1₁⁺, 2₁⁺ and 2₂⁺ as compared with the experimental data, respectively. The J^π = 3₉⁺ levels confirmed as positive parity. This study also confirmed the J^π=(1₂⁺), (3₂⁺), (4₁⁺), (5₁⁺), (2₄⁺), (2₅⁺), (4₇⁺) and 2₁₀⁺ levels with the calculated energies (1.281, 1.708, 1.628, 2.977, 2.236, 3.065, 4.683 and 5.303) MeV, respectively. When compared with the process values. The levels of for which the angular momentum and parity are yet unknown at the states J^π=0₁⁺, 4₂⁺, 1₃⁺, 1₄⁺, 3₃⁺, 0₂⁺, 4₄⁺, 3₄⁺, 3₅⁺, 1₆⁺, 4₅⁺, 2₈⁺, 1₇⁺, 1₉⁺, 6₅⁺ and 0₈⁺, respectively. New energy levels were predicted at the states J^π=7₄⁺, 7₅⁺, 0₉⁺, 0₁₀⁺, 7₆⁺, 7₇⁺, 7₈⁺, 8₂⁺, 9₁⁺, 7₉⁺, 8₃⁺, 7₁₀⁺, 8₄⁺, 8₅⁺, 8₆⁺, 8₇⁺, 8₈⁺, 9₂⁺, 8₉⁺, 8₁₀⁺, 9₃⁺, 10₁⁺, 9₄⁺, 10₂⁺, 9₅⁺, 9₆⁺, 9₇⁺, 9₈⁺, 10₃⁺, 9₉⁺, 9₁₀⁺, 10₄⁺, 10₅⁺, 11₁⁺, 10₆⁺, 10₇⁺, 10₈⁺, 10₉⁺, 11₂⁺, 10₁₀⁺, 11₃⁺, 11₄⁺, 11₅⁺, 11₆⁺, 12₁⁺, 11₇⁺, 11₈⁺, 11₉⁺, 12₂⁺, 11₁₀⁺, 12₃⁺, respectively.

Table 2: Comparison of the experimental excitation energies[14] and excitation energies predictions for ²⁶Na nucleus by using USDB interactions

J ^π (OXBASH)	Energy (OXBASH) USDA (MeV)	Energy (exp.) (MeV)	J ^π (exp.)
3 ₁ ⁺	0.000	0.000	3 ⁺
1 ₁ ⁺	0.004	0.082	1 ⁺
2 ₁ ⁺	0.108	0.232	2 ⁺
2 ₂ ⁺	0.325	0.406	2 ⁺
1 ₂ ⁺	1.281	1.509	(1 ⁺)
4 ₁ ⁺	1.628	1.660	-----
3 ₂ ⁺	1.708	1.808	(3 ⁺)
0 ₁ ⁺	1.740	-----	-----
4 ₂ ⁺	1.988	1.996	(4 ⁺)
2 ₃ ⁺	2.059	2.045	-----
5 ₁ ⁺	2.224	2.118	(5 ⁺)
2 ₄ ⁺	2.236	2.192	(2 ⁺)
1 ₃ ⁺	2.450	2.452	-----
1 ₄ ⁺	2.677	2.720	(1 ⁺)
3 ₃ ⁺	2.726	2.803	-----
5 ₂ ⁺	2.977	-----	-----
4 ₃ ⁺	2.998	-----	-----
2 ₅ ⁺	3.065	3.222	(2 ⁺)
0 ₂ ⁺	3.231	3.304	-----
4 ₄ ⁺	3.434	3.417	-----
1 ₅ ⁺	3.530	-----	-----

2 ₆ ⁺	3.542	-----	-----
3 ₄ ⁺	3.644	3.603	-----
3 ₅ ⁺	3.791	3.814	-----
4 ₅ ⁺	3.985	3.966	-----
1 ₆ ⁺	4.086	-----	-----
3 ₆ ⁺	4.243	4.188	-----
2 ₇ ⁺	4.269	-----	-----
3 ₇ ⁺	4.429	-----	-----
2 ₈ ⁺	4.433	4.440	-----
4 ₆ ⁺	4.461	-----	-----
2 ₉ ⁺	4.525	-----	-----
6 ₁ ⁺	4.591	-----	-----
4 ₇ ⁺	4.683	-----	-----
5 ₃ ⁺	4.703	4.702	-----
1 ₇ ⁺	4.851	-----	-----
3 ₈ ⁺	4.872	-----	-----
0 ₃ ⁺	4.873	-----	-----
3 ₉ ⁺	4.938	-----	-----
5 ₄ ⁺	4.960	4.915	-----
6 ₂ ⁺	5.117	-----	-----
4 ₈ ⁺	5.202	4.970	(4 ⁺)
1 ₈ ⁺	5.213	-----	-----
5 ₅ ⁺	5.243	-----	-----
2 ₁₀ ⁺	5.303	5.080	(2 ⁺)
3 ₁₀ ⁺	5.349	5.480	-----
1 ₉ ⁺	5.634	-----	-----
6 ₃ ⁺	5.715	-----	-----
1 ₁₀ ⁺	5.724	-----	-----
4 ₉ ⁺	5.791	-----	-----
7 ₁ ⁺	5.914	-----	-----
5 ₆ ⁺	5.940	-----	-----
4 ₁₀ ⁺	6.162	-----	-----
0 ₄ ⁺	6.181	-----	-----
5 ₇ ⁺	6.257	-----	-----
5 ₈ ⁺	6.414	-----	-----
5 ₉ ⁺	6.578	-----	-----
6 ₄ ⁺	6.583	-----	-----
5 ₁₀ ⁺	6.793	-----	-----
7 ₂ ⁺	6.999	-----	-----
6 ₅ ⁺	7.009	-----	-----
0 ₅ ⁺	7.034	7.200	-----
6 ₆ ⁺	7.522	-----	-----
6 ₇ ⁺	7.802	-----	-----
0 ₆ ⁺	7.847	-----	-----
6 ₈ ⁺	8.134	-----	-----
0 ₇ ⁺	8.150	-----	-----
6 ₉ ⁺	8.202	-----	-----
7 ₃ ⁺	8.347	-----	-----
8 ₁ ⁺	8.513	-----	-----
6 ₁₀ ⁺	8.660	-----	-----
7 ₄ ⁺	8.846	-----	-----
0 ₈ ⁺	9.060	9.000	-----
7 ₅ ⁺	9.068	-----	-----
0 ₉ ⁺	9.207	-----	-----
7 ₆ ⁺	9.357	-----	-----
0 ₁₀ ⁺	9.693	-----	-----
7 ₇ ⁺	9.726	-----	-----
9 ₁ ⁺	9.859	-----	-----
7 ₈ ⁺	9.990	-----	-----
8 ₂ ⁺	10.014	-----	-----

7 ₉ ⁺	10.343	-----	-----
8 ₃ ⁺	10.446	-----	-----
7 ₁₀ ⁺	10.581	-----	-----
8 ₄ ⁺	11.104	-----	-----
8 ₅ ⁺	11.441	-----	-----
8 ₆ ⁺	11.549	-----	-----
8 ₇ ⁺	11.790	-----	-----
9 ₂ ⁺	12.415	-----	-----
8 ₈ ⁺	12.428	-----	-----
8 ₉ ⁺	12.738	-----	-----
9 ₃ ⁺	12.738	-----	-----
8 ₁₀ ⁺	12.839	-----	-----
9 ₄ ⁺	13.252	-----	-----
10 ₁ ⁺	13.456	-----	-----
9 ₅ ⁺	13.605	-----	-----
9 ₆ ⁺	14.287	-----	-----
9 ₇ ⁺	14.824	-----	-----
9 ₈ ⁺	15.222	-----	-----
10 ₂ ⁺	15.441	-----	-----
9 ₉ ⁺	15.844	-----	-----
9 ₁₀ ⁺	15.886	-----	-----
10 ₃ ⁺	16.217	-----	-----
10 ₄ ⁺	16.892	-----	-----
11 ₁ ⁺	17.297	-----	-----
10 ₅ ⁺	17.888	-----	-----
10 ₆ ⁺	18.340	-----	-----
10 ₇ ⁺	18.565	-----	-----
11 ₂ ⁺	19.050	-----	-----
10 ₈ ⁺	19.097	-----	-----
10 ₆ ⁺	19.293	-----	-----
10 ₇ ⁺	19.531	-----	-----
11 ₂ ⁺	19.582	-----	-----
11 ₃ ⁺	21.628	-----	-----
11 ₄ ⁺	22.932	-----	-----
11 ₅ ⁺	23.594	-----	-----
11 ₆ ⁺	23.669	-----	-----
12 ₁ ⁺	23.758	-----	-----
11 ₇ ⁺	24.865	-----	-----
11 ₆ ⁺	25.336	-----	-----
12 ₂ ⁺	25.736	-----	-----
11 ₈ ⁺	26.025	-----	-----
12 ₃ ⁺	31.664	-----	-----

4.2 : B(E2) and B(M1)

Transition rates are a sensitive indicator for most modern effective interactions developed to describe the sd-shell region. This sensitivity resulting from the adoption of transition rates on the single particle wave function (Hamiltonian eigenvectors). In this section, the theoretical and experimental reduced electric quadrupole transition probability B(E2) (in units of e²fm⁴) and reduced magnetic dipole transition probability B(M1) (in units of μ₂, μ Bohr magneto) values for ^{24,26}Na isotope [15]. The comparison between theoretical and experimental B(E2) shows an advantage for USDB calculations for many states. The reduced magnetic dipole transition probabilities B(M1) results gave a clear advantage to the USDB calculations compared to the other Hamiltonians results. The transition strengths calculated in this work performed using the harmonic oscillator potential HO for each in-band transition by assuming pure B(E2) transition. Core polarization effect were included by choosing the effective charges for proton and for neutron e_p = e_n = 0.350e. We also calculated magnetic quadrilateral transition probability B(M1), Values of effective charge are (e_p = e_n = 0.350e) and the free nucleon g factors are g_s(p) = 5.586, g_s(n) = -3.826, g_l(p) = 1 and g_l(n) = 0. New electric and magnetic { B(E2), B(M1), } transitions were expected in Our results by using (USDB) interaction are listed in Tables (3 and 4) for ²⁴Na nucleus and Tables (5 and 6) for ²⁶Na nucleus, transition probabilities gives agreement comparing with experimental data.

Table 3. Comparison of the B(E2) results in unit $e^2 \text{fm}^4$ for ^{24}Na nucleus with the experimental data[13].

$J_i \rightarrow J_f$	B (E2)our Results for USDB ($e^2\text{fm}^4$)($e_p=0.350, e_n=0.350$)	B (E2; \downarrow) Exp. Results($e^2\text{fm}^4$)
$2_1^+ \rightarrow 4_1^+$	17.71	-----
$2_2^+ \rightarrow 4_1^+$	9.963	-----
$3_1^+ \rightarrow 4_1^+$	1.263	1.685
$5_1^+ \rightarrow 4_1^+$	40.84	-----
$3_2^+ \rightarrow 4_1^+$	6.479	-----
$4_2^+ \rightarrow 4_1^+$	3.778	-----
$5_2^+ \rightarrow 4_1^+$	1.618	-----
$6_1^+ \rightarrow 4_1^+$	7.237	-----
$6_2^+ \rightarrow 4_1^+$	3.444	-----
$2_1^+ \rightarrow 1_1^+$	33.81	-----
$2_2^+ \rightarrow 1_1^+$	10.65	-----
$2_3^+ \rightarrow 1_1^+$	3.275	4.934
$3_1^+ \rightarrow 1_1^+$	13.38	-----
$3_2^+ \rightarrow 1_1^+$	5.527	-----
$2_2^+ \rightarrow 2_1^+$	17.67	-----
$3_1^+ \rightarrow 2_1^+$	30.73	1.233
$3_2^+ \rightarrow 2_1^+$	2.929	2.878
$4_2^+ \rightarrow 2_1^+$	19.93	-----
$0_1^+ \rightarrow 2_1^+$	12.59	-----
$0_2^+ \rightarrow 2_1^+$	0.9825	-----
$1_2^+ \rightarrow 3_1^+$	0.5084	-----
$3_2^+ \rightarrow 3_1^+$	2.590	-----
$5_1^+ \rightarrow 3_1^+$	14.27	-----
$4_2^+ \rightarrow 3_1^+$	19.24	-----
$3_2^+ \rightarrow 5_1^+$	0.4727	-----
$4_2^+ \rightarrow 5_1^+$	2.732	-----
$5_2^+ \rightarrow 5_1^+$	2.530	-----
$6_1^+ \rightarrow 5_1^+$	40.85	-----
$7_1^+ \rightarrow 5_1^+$	10.20	-----
$6_2^+ \rightarrow 5_1^+$	0.5711	-----
$7_1^+ \rightarrow 6_1^+$	26.25	-----
$6_2^+ \rightarrow 6_1^+$	0.9019	-----
$7_2^+ \rightarrow 6_1^+$	8.791	-----
$8_1^+ \rightarrow 6_1^+$	16.21	-----
$8_2^+ \rightarrow 6_1^+$	1.142	-----
$6_2^+ \rightarrow 7_1^+$	0.6661	-----
$7_2^+ \rightarrow 7_1^+$	6.243	-----
$8_1^+ \rightarrow 7_1^+$	15.35	-----
$8_2^+ \rightarrow 7_1^+$	18.65	-----

Table 4. Comparison of the B(M1) results in unit μ^2 for ^{24}Na nucleus with the experimental data[13].

$J_i \rightarrow J_f$	B(M1) Cal. Results USDB	Exp. results
$3_1^+ \rightarrow 4_1^+$	0.2697	0.3401
$5_1^+ \rightarrow 4_1^+$	0.3228	-----
$4_2^+ \rightarrow 4_1^+$	0.06733	-----
$2_1^+ \rightarrow 1_1^+$	1.135	-----
$2_2^+ \rightarrow 1_1^+$	0.6632	-----
$2_3^+ \rightarrow 1_1^+$	0.006045	0.020406
$3_1^+ \rightarrow 2_2^+$	0.1770	-----
$3_2^+ \rightarrow 3_1^+$	0.03513	-----
$4_2^+ \rightarrow 3_1^+$	0.8562	-----
$0_1^+ \rightarrow 1_1^+$	0.2025	-----

$0_2^+ \rightarrow 1_1^+$	0.7856	-----
$0_1^+ \rightarrow 1_2^+$	0.2719	-----
$0_2^+ \rightarrow 1_2^+$	0.0002657	-----
$4_2^+ \rightarrow 5_1^+$	0.3917	-----
$6_1^+ \rightarrow 5_1^+$	0.2873	-----
$6_2^+ \rightarrow 6_1^+$	0.02435	-----
$7_1^+ \rightarrow 6_1^+$	0.3229	-----
$7_2^+ \rightarrow 6_1^+$	0.02950	-----
$6_2^+ \rightarrow 7_1^+$	0.0002075	-----
$7_2^+ \rightarrow 7_1^+$	0.01240	-----
$8_1^+ \rightarrow 7_1^+$	0.001071	-----
$8_2^+ \rightarrow 7_1^+$	0.006340	-----
$3_2^+ \rightarrow 2_1^+$	0.7838	0.4654
$3_3^+ \rightarrow 4_1^+$	0.002568×10^{-3}	0.003938

Table5. Comparison of the B (E2) results in unit $e^2 \text{ fm}^4$ for ^{26}Na nucleus with the experimental data

$J_i \rightarrow J_f$	B (E2)our . Results ($e^2 \text{ fm}^4$) $e_n=0.350, e_p=0.350$	B (E2)Exp. Results ($e^2 \text{ fm}^4$) [16]
$1_1^+ \rightarrow 3_1^+$	19.05	16.47
$2_1^+ \rightarrow 3_1^+$	20.02	50.325
$2_2^+ \rightarrow 3_1^+$	14.05	13.725
$1_2^+ \rightarrow 3_1^+$	18.11	-----
$3_2^+ \rightarrow 3_1^+$	3.897	-----
$4_2^+ \rightarrow 3_1^+$	4.745	-----
$4_1^+ \rightarrow 3_1^+$	2.317	-----
$5_1^+ \rightarrow 3_1^+$	23.66	-----
$5_2^+ \rightarrow 3_1^+$	2.499	-----
$2_1^+ \rightarrow 1_1^+$	5.662	-----
$3_2^+ \rightarrow 1_1^+$	48.58	86.925
$1_2^+ \rightarrow 1_1^+$	2.121	-----
$3_2^+ \rightarrow 1_1^+$	10.69	-----
$2_2^+ \rightarrow 1_1^+$	25.01	2.287
$2_2^+ \rightarrow 2_1^+$	2.342	-----
$1_2^+ \rightarrow 2_1^+$	0.1018	-----
$0_1^+ \rightarrow 2_1^+$	25.04	-----
$3_2^+ \rightarrow 2_1^+$	14.00	-----
$4_1^+ \rightarrow 2_1^+$	8.920	-----
$4_2^+ \rightarrow 2_1^+$	14.14	-----
$1_2^+ \rightarrow 2_2^+$	16.17	-----
$0_1^+ \rightarrow 2_2^+$	0.6580	-----
$3_2^+ \rightarrow 2_2^+$	0.7810	-----
$4_1^+ \rightarrow 3_2^+$	0.1757	-----
$4_2^+ \rightarrow 3_2^+$	22.25	-----
$0_2^+ \rightarrow 2_2^+$	1.683	-----
$5_1^+ \rightarrow 3_2^+$	1.778	-----
$5_2^+ \rightarrow 3_2^+$	0.8589	-----
$4_2^+ \rightarrow 4_1^+$	0.3302	-----
$5_1^+ \rightarrow 4_1^+$	0.9571	-----
$5_2^+ \rightarrow 4_1^+$	50.15	-----
$6_1^+ \rightarrow 4_1^+$	13.23	-----
$6_2^+ \rightarrow 4_1^+$	0.2773	-----
$5_2^+ \rightarrow 5_1^+$	2.499	-----
$6_1^+ \rightarrow 5_1^+$	0.3603	-----
$6_2^+ \rightarrow 5_1^+$	2.326	-----
$7_1^+ \rightarrow 5_1^+$	23.08	-----
$7_2^+ \rightarrow 5_1^+$	6.905	-----
$6_2^+ \rightarrow 6_1^+$	0.02135	-----

$7_1^+ \rightarrow 6_1^+$	27.73	-----
$7_2^+ \rightarrow 6_1^+$	5.222	-----
$8_1^+ \rightarrow 6_1^+$	30.70	-----
$8_2^+ \rightarrow 7_1^+$	0.1888	-----
$8_2^+ \rightarrow 6_1^+$	0.1721	-----
$8_1^+ \rightarrow 7_1^+$	16.38	-----
$7_2^+ \rightarrow 7_1^+$	2.497	-----
$9_1^+ \rightarrow 7_1^+$	25.83	-----
$9_2^+ \rightarrow 7_1^+$	0.01602	-----
$8_2^+ \rightarrow 8_1^+$	2.309	-----
$9_1^+ \rightarrow 8_1^+$	18.54	-----
$9_2^+ \rightarrow 8_1^+$	1.897	-----

Table6. Comparison of theB(M1) results in unit μ^2 for ^{26}Na nucleus with the experimental data

$J_i \rightarrow J_f$	B(M1) our. Results	B(M1) Exp. Results[16]
$2_1^+ \rightarrow 3_1^+$	0.1531	0.00179
$2_2^+ \rightarrow 3_1^+$	0.6216	0.002685
$4_1^+ \rightarrow 3_1^+$	0.0008276	-----
$3_2^+ \rightarrow 3_1^+$	0.1328	-----
$4_2^+ \rightarrow 3_1^+$	0.2971	-----
$2_1^+ \rightarrow 1_1^+$	0.08654	0.00537
$2_2^+ \rightarrow 1_1^+$	0.4041	0.000716
$0_1^+ \rightarrow 1_1^+$	0.4252	-----
$0_2^+ \rightarrow 1_1^+$	0.3141	-----
$2_2^+ \rightarrow 2_1^+$	0.3470	-----
$3_2^+ \rightarrow 2_2^+$	0.02708	-----
$3_2^+ \rightarrow 2_1^+$	0.02708	-----
$4_2^+ \rightarrow 4_1^+$	0.004789	-----
$1_2^+ \rightarrow 1_1^+$	0.05102	-----
$5_1^+ \rightarrow 4_1^+$	0.08585	-----
$5_2^+ \rightarrow 5_1^+$	0.05243	-----
$6_1^+ \rightarrow 5_1^+$	0.001111	-----
$6_2^+ \rightarrow 6_1^+$	0.1046	-----
$7_1^+ \rightarrow 6_1^+$	0.04680	-----
$7_2^+ \rightarrow 7_1^+$	0.2052	-----
$8_1^+ \rightarrow 7_1^+$	0.06191	-----
$8_2^+ \rightarrow 7_1^+$	0.01022	-----

5. Conclusions

Full sd-space shell model calculations were performed using the code OXBASH for Windows. The SD model space are employed with the effective interactions(USDB) to reproduce the level spectra , reduced electric quadrupole transition probability B(E2) and magnetic quadrilateral transition probability B(M1)for the nuclei $^{24,26}\text{Na}$. Good agreement were obtained by comparing these calculations with the recently available experimental data for the level spectra using USDB effective interaction. Calculation of the transition strengths prove that USDB is more consistent in for the(sd-shell) region.

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Human Resource Management

Andrea Disanferdinand

Southern New Hampshire University

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Abstract- Human resource management plays a vital role in the structure of every organization. It is the backbone of the company, responsible for recruiting, managing, and directing all of its employees, managing them as well as the workplace as a whole (Griffith College, 2011). For a company striving for upward mobility and achievement, good human resource management is imperative. As the company changes, the human resource department must not only adapt to that change, but in a sense, forecast those changes so that it is prepared to deal with the challenges ahead. The following research paper will give a comprehensive human resource management review as well discuss in depth the key components of human resource management:

- 1- Evaluating strategic talent management initiatives along with the functions and practices of staffing.
- 2- Employee development processes.
- 3- Performance management.
- 4- Compensation.

Index Terms- Human resource management, organization, company, workplace, changes, department, evaluate, talent, staffing, employee, performance management, compensation

I. INTRODUCTION

The case study A.P. Moller-Maersk Group: Evaluating Strategic Talent Management Initiatives gives a detailed example as to why HR function needs to fall in line with the company's overall plan. As a company grows, as it inevitably will if it is to succeed, its needs will change. As its needs change, employee needs change as well. In the case of Maersk, they started out as a smaller company that had a family style culture. They hired young, inexperienced people, trained them, and saw them until their 50th year anniversaries. Unfortunately, the company was slow to discipline and get rid of underperformers, which brought the company down when it was time to become globally diversified. Once their business so radically changed and expanded, their HR department had to take a second look at what kind of talent they were acquiring, how they were training them, what kind of experience new hires had going in, and how they were going to handle their personal development. In the end, it was decided that they needed more experienced staff, more leadership development, and better performance management. They decided to handle conflict and let go of underperforming staff. The old mom and pop way might have worked once upon a time, but globalization called for change, and Maersk's HR department had to meet that head on (Abbott & Groysberg, 2013).

Such goal alignment is important not only in the case of Maersk and other globalized businesses. It is important for every single organization. Human resources and employees are the heartbeat of any company. They can make it or break it. It is of utmost importance for an organization's HR department to recognize the company's needs, how they expand with time, and what sort of employees would best fit the company's culture and infrastructure so that goals and objectives can be successfully met.

This brings us to recruitment and selection of employees, which is a part of job analysis. Job analysis is the practice of studying a job to learn what it is about - What actions does it require? What are its responsibilities? How does it tie in to other jobs within an organization? What sort of people are required to perform its duties? It is important to note that here, the job itself is under analysis, not the people who apply for it (SHRM, 2017). There are several uses for job analysis. One of them is recruitment and selection, which is the process followed to choose the best qualified person for the position. The first step is posting the position with an accurate job description. The next step is screening applicants to discover the ones they want to interview. Next is the interview itself. Here is where various assessment questions will be asked to get a good sense of which skills the applicant possesses as well as traits to excel in the job (Kokemuller, 2018). The human resource department is looking for talent, and they can find it in one of two places: Internally – Recruit employees already within the organization, or Externally – Recruit employees who do not work within the organization.

Internal recruitment can include existing employees within the system who usually want to make an upward or lateral move within the organization, and is oftentimes based on seniority. It can also include former employees who are interested in re-hire (Surbhi, 2015). According to Surbhi (2015), the most common methods of internal recruitment include: Posting the position internally, promotion, transfer, reemployment of former employees, retirees, or employees hired previously for part time or contracted work. It definitely has its perks. For one thing, it boosts employee morale. Employees like the idea of being able to advance one day. There's no need for job orientation. It's quick and cost effective. Conversely, if handled improperly, grooming employees for an advanced position could come across to other employees as favoritism and have the reverse effect of decreasing morale and even introducing hostility and mistrust into the work environment.

External recruitment is a qualification based tactic that enables the recruiter to seek out the top candidates from a large pool. It brings fresh ideas to an organization, but it isn't without its drawbacks. For one thing, it costs money to advertise the jobs,

train the employees and orient them to the organization (2015). Some examples of external recruitment are: Campus recruitment, job websites, job fairs, waiting lists, employment exchanges, job consultants, referrals, walk ins, advertisements in papers, magazines, online, etc (2015).

Comparison Chart (2015)

COMPARISON	INTERNAL RECRUITMENT	EXTERNAL RECRUITMENT
Meaning	Recruiting candidates who are already in the system.	Recruiting candidates who do not work within the system.
Basis	Seniority	Qualification
Time taken	Fast	Slow
Induction training	Not necessary	Necessary
Cost	Inexpensive	Costly
Choice of candidates	Limited	Unlimited
Sources	Transfer, promotion, referral, etc.	Ads, callers, agencies, consultants, etc.

In the case of Maersk, as previously stated, at the onset of their business when it was family owned and not yet globalized, they hired their employees young, trained them, and typically kept them until the day they retired. However, times changed and the fabric of the employee changed. People were no longer content to stay with who they knew for its own sake. They were now interested in seeking out the competition and seeing what they had to offer. Maersk had to ask the question, just what does the competition have that we don't? They were suddenly experiencing the largest number of employee turnovers in their company's history. They had to rethink their strategy. In the past, training a brand new, inexperienced employee was worth the investment because in turn, they got a good worker for life. Now they are asking if it might be smarter to hire experienced individuals who do not need as much training and development. How would they integrate them into the system? Should they consider rehiring former employees? For such an expanded business, Maersk had an extremely inclusive culture, and they needed to decide whether that was to their benefit or detriment (2013).

Maersk's human resource department, in an effort to align appropriate talent with the global conglomerate they had become, implemented a new talent management process that consisted of five components:

- 1- Attraction - Bring the right talent into the company.
- 2- Identification – Get their top performers together and fit them into the most important positions.
- 3- Development – Train the new employees appropriately, and implement continuous education for all employees so that they can keep up with the changes in the system.
- 4- Deployment – Identify internal employees who might be willing to relocate.
- 5- Scenario planning – Develop “the five year plan” for the business.

Of course, after all of this, there would be performance evaluations as well, which are important opportunities for any company to have one on one talks with employees so they can give one another feedback.

During this time, Maersk's HR department realized that they had spent a lot of time focusing on internal hires, neglecting the freshness that external hires could bring to the company. They decided to not completely do away with hiring internally, but were now much more open to hiring experienced talent from the outside. In addition to that, they also began considering rehiring former employees, many of whom were not fired, but laid off at some point. In fact, it was found that many of the re-hires in that category were at one time ranked as top performers. This can be a very good idea in many instances because not only are they quicker to train, but their clear sense of what they are walking into tends to lead to higher employee retention rates (2013).

It is important to mention that Maersk is a Danish company, which comes with its own set of cultural rules. They thought Danish, spoke Danish, and pretty much only hired and trained Danish. These days, Maersk's culture is much more diverse. In fact, they now speak only English at every meeting.

It appears to me, a complete layperson in the business world as of yet, that Maersk got off to a fairly slow start. They wanted to retain their Danish tradition and keep that family feeling intact. That worked well for them in their infancy up to the days just before they expanded into a global conglomerate. However, it doesn't seem as though it took them long to get with the proverbial program. In essence, they were business people. They knew how things worked. They saw the changes going on around them. And they knew that presently, they simply did not have the employee/talent base necessary to enable them to succeed in a much larger business world. Their HR department put together a comprehensive plan, mixed a little bit of the old with a lot of new and found something that worked for them. I liked the fact that they kept internal hires but remained open to external hires. Great talent can be found anywhere. It is too broad of a world to narrow your choices to one pool. I also liked their development plan. While the article didn't come right out and say that it planned “continuing education” for current employees, it did admit that training was always saved for new employees, but now, “a greater emphasis was now placed on the training needs of experienced employees” (2013). As a person who stayed with the same company for 18 years, this is extremely important to me. For one thing, all employees should be kept abreast of any new technology that is being used or any other new changes because it will increase their performance. It is good for both the employer and the employee. Another thing is the generation gap that exists within organizations. As much as I hate to say it, oftentimes younger people don't believe that other generations are as technologically advanced as they are. Continuing education debunks that theory off the bat. Everyone receives the same training. Everyone is proficient at the job. No one feels left out or “passed by”. Furthermore, if everyone has equal skill sets, workloads can be distributed more fairly. No one has to “pick up the slack” for those who don't know how to perform a particular task or isn't qualified to work in a certain area. I have seen this happen more times than I can count. I've worked with a number of senior employees (myself included)

who attend seminars and in-services on new policies, equipment, etc, and they are happy to be able to work in all areas of the hospital. If they're needed in the ICU, they can go there, and so on. But then there are some who are getting "passed by" by younger employees who are up on all the most recent technology and training available. The point is, it is available to everyone. Other than that, I feel that Maersk's HR department did a fine job at not only bringing the company up to speed with current times, but in developing a future plan. Again, HR not only has to keep up with current changes, but speculate on the future of the company.

II. EMPLOYEE TRAINING

"The goal of the training needs assessment is to identify performance issues that can be remedied through the introduction, practice, or reinforcement of specific and measurable knowledge and/or skill sets." (Sharif, 2015). In other words, who needs to be trained within the organization, and for what? According to Sharif (2015), there are two types of training needs assessments: Proactive and reactive. Proactive assessments are future focused, used to determine what the organization will need in response to its future changes. These include time consuming strategies such as online surveys, focus groups, and knowledge tests. Reactive assessments are based on current employees. They are much quicker than proactive assessments, usually involving a one on one interview with management to get a better idea of the reason behind the request for training and what they hope to achieve with this training (2015). Sharif (2015) identified seven components of a successful training needs assessment. These can pertain to both proactive and reactive assessments:

- 1- There is a verified performance issue that can be fixed with appropriate training. This issue involves skills that can be taught. This can range from anything from a new policy that can be taught via a brief memo or meeting to an employee's personal performance, which would require performance management.
- 2- The issue is critical to the success of the organization. Is the issue major or minor? Prioritization may be needed in this instance.
- 3- The correct target audience has been recognized. Who exactly is in need of the assessment – The employee, or the manager? It may not always be that the employee lacks the skills to do the job. It could be poor communication, delegation, or planning on the part of the manager. This needs to be recognized and addressed appropriately.
- 4- The correct training content has been identified. What needs to be taught? What is the cause of the performance issue? Here, it must be ensured that the correct content will be taught to the correct target audience.
- 5- The desired outcome is realistic. Time allotted for training is critical. Some things can be learned in one day, say a new policy. Some things may take a week to learn, such as new equipment. The appropriate employees must learn appropriate tasks. For instance, it would be unrealistic to expect a cafeteria cashier to

learn the job of Dietary Manager in one day or even one week. But you can expect the cashier to learn a new computerized cash register in a reasonably short amount of time. Whatever the case, the plan must be realistic.

- 6- The training is cost effective. If a number of employees need training, then it is reasonable for a company to invest in a training program. If one or two individuals have some performance issues, then it would not make sense to invest in an expensive training program. It would be far more reasonable to set these individuals up with a public seminar or webinar course.
- 7- The training program must be compatible with work schedules. Many organizations have two or more different shifts, so the program must be planned accordingly, so that everyone has an opportunity to attend.

In the case Maersk, a new position was posted for a CARE Business Partner in their Charlotte, North Carolina office. The new employee will be a local candidate with excellent customer service skills, direct call handling experience, relationship building experience, great communication and listening skills, negotiation and conflict resolution skills, and demonstrate Microsoft Suite efficiency. They must be a high school graduate or have a diploma equivalent. 1-2 years of experience in transportation is desired. Key job responsibilities will include:

- Customer advocacy.
- Customer service and satisfaction.
- Relationship building. Use relationships to facilitate fast equipment turnaround and collection of applicable charges as required. Marketing analysis, market competitor awareness and interaction is necessary.
- Ensure the entire shipping life cycle runs smoothly. Act as a liaison between customers and internal support groups via pro-active resolution handling and issue resolution ownership.
- Process improvement. Recognize how to reduce waste.
- Understand claim policy.
- Understand KPI's and act in line with set targets. Continuously seek out opportunities for improvements and lower costs.
- Monitor agreed service levels. Identify root causes when targets not met. Confer with management on this level.
- Participate in team reviews.
- Consistently uphold the values of the A.P. Moller – Maersk organization.

This new position falls in line with the qualifications necessary to conduct a training needs assessment as identified by Sharif (2015). This is not a job that has yet existed within this organization, so it is safe to assume that there are no existing employees who meet the criteria necessary to carry out the responsibilities. Therefore, a need for training has been established. Maersk is a newly globalized company with many branches, many business contacts, and many customers. This position will ensure that the three are tied together to provide for

a seamless shipping experience from start to finish. To say that the position and the training required for it are critical to the success of the organization would be accurate. The target audience for the training would be the person hired for this position and their manager. Since the job description is clearly outlined, it is known what will need to be taught, and it is realistically achievable, provided that the correct candidate is hired and enough time is allotted for them to be trained. A cost-effective training program will be chosen, and it will be ensured that the training schedule is appropriate time wise.

Since appropriate criteria has been established to move forward for a training needs assessment, it is important to note the steps of a proper assessment and how it should be done for the position of CARE Business Partner at Maersk. Four steps have been identified by the Society for Human Resources Management (2014). They are as follows:

- 1- Identify the business need. It is crucial for the person who is conducting the training needs assessment to first know the organization itself. Know its goals, priorities and needs. In the case of Maersk, a newly globalized company, it is known that there is a need for strong customer service to help build the company and assure a smooth shipping cycle, whether it is B2B to B2C. Essentially, they need a marketer.
- 2- Perform a gap analysis. Such an analysis could be performed through searching HR records for various things such as safety reports, grievances filed, job competencies and attendance records, etc. It could be done via interviews, surveys, questionnaires, self-assessments, or observations. It could also be done with focus groups who would question employees about training needs. A gap is defined as “the difference between the existing state and the desired state” (SHRM, 2014). In the case of Maersk, the existing state is the lack of a marketer, or CARE Business Partner. The desired state would be the acquisition of this talent, fully trained and performing the job at a high level.
- 3- Assess training options. Here is where various solutions will be presented. Cost will be taken into consideration as well. It is important to consider whether the new employee will be an internal or external hire. If the employee is an internal hire, basic company orientation will not be necessary as it would be with an external hire. That aside, some options for training could be webinars, seminars, self-directed online study, and one on one training conducted by a preceptor, potentially including both presentation via lecture and hands on methods. The latter part would be performed as on the job training using behavior modeling, role playing, and simulations.
- 4- Report training needs and recommend training plans. Here, priorities need to be set and questions need to be asked. Who will be trained on what? Where will the training occur? Should someone be hired to do the training? Are there any in-house experts on what needs to be taught? Can the training be done online? What is the learning style of the new employee? When considering the new position at Maersk, again we need

to understand that this is a new position that has not been filled before. So who gets trained? We must assume that marketing and relationship building has been done before on some level since Maersk has an existing clientele. Maersk began as a small, family style company with several employees who handled customer relations. Who among them stands out? One of them could be a strong candidate as a preceptor. We would want to choose someone who has strong interpersonal, communication, negotiation, and computer skills to pass on to the new employee. Before that occurred, it would be a good idea to sign them up for seminars and webinars to not only learn the art of precepting a new employee, but also to enrich their own skills. Once that has been established, a training plan will have to be created for the new CARE Business Partner.

When creating a training plan, it is necessary to keep not only the goals, but the objectives of the organization in mind. Goals and objectives are two separate things. Goals are of a broad spectrum that has a specific outcome in mind. Objectives are the means used to achieve the goals (MicroTek, 2017). The organization itself has objectives, the departments within the organization have objectives, the jobs within the organization have objectives, and the training plans for the jobs have objectives. There is an acronym to keep in mind when creating training plan objectives: S.M.A.R.T. It stands for Specific, Measurable, Achievable, Realistic, and Time-Oriented. According to MicroTek (2017), each point is defined as the following:

- Specific: Clearly state objectives. There should be no room for misinterpretation.
- Measurable: Objectives should show obvious proof of accomplishment.
- Achievable: Objectives should be challenging, yet doable.
- Realistic: Objectives should not have outlandish expectations. MicroTek (2017) provides another “R” here as Relevant, meaning that the means should achieve the end.
- Time-Oriented: A timeline to complete the objectives should be indicated.

There are several notable benefits to using SMART in your training plan. For one thing, it can result in lower costs. Good training results in lower employee turnover rates, reduced on the job accidents, and better efficiency. On the other end of the spectrum, it can increase the company’s profits with effective customer relations training, especially sales. It can improve operational efficiency and customer satisfaction, as well as “time-to-market or accelerate time-to profit”. The latter ties in competency and performance metrics (2017).

When developing training objectives, it is necessary to consider the activities that will be included in the employee development process. Employee learning activities help the employee’s growth to become a productive member of the organization. There are several reasons for this, as outlined by Juneja (2018):

- Learning activities will help the new Maersk employee refresh their skills and enhance their existing knowledge, which will result in better overall performance. We are assuming that the new hire already possesses the required customer care experience set forth in the job description. Some refreshers might include role playing, with the preceptor in the role of the customer. There could be simulations such as a direct call that requires listening and negotiating. There could be another set up so that the new employee has to resolve a conflict. There could be another role that the preceptor plays as a brand new customer or a fellow marketer. There are new things to be learned in each instance, with direction, feedback and constructive criticism given on each count.
 - Learning activities will help develop the new Maersk employee both professionally and personally. It is human nature to take pride in one's work and to feel good when accomplishing something. According to Juneja (2018), "training helps an employee to perform their personal best, eventually benefitting the organization and yielding higher profits."
 - Learning activities can build a culture of learning within the organization where everyone is motivated to acquire a new skill. The new employee aside, this would be an attribute to the Maersk company. If everyone had the drive to succeed, it would only make the work environment and the organization itself better. This is especially important in light of the fact that once upon a time, Maersk had difficulty with complacent, underperforming employees that management was slow to discipline.
 - Learning activities enable the employee to do self-analysis. The new Maersk employee will, upon completion of each activity, be given time to reflect on his or her performance and how they can do better next time.
 - Learning activities could strengthen the relationship among the employees at Maersk. There is a sort of camaraderie among students of all kinds – Childhood, adolescent, adult, school, extracurricular activities, and work. At Maersk, continuing education can become a necessity within the organization. There could be seminars, group assignments, events that will involve employee interaction and even create a healthy sense of competition. This will go a long way in overall improvement of the organization.
- 3- They have high motivation to learn.
 - 4- They are more pragmatic in their learning.
 - 5- The role of learner is secondary to other roles they've taken on.
 - 6- They must fit learning into their busy schedules.
 - 7- They can lack confidence.
 - 8- They are more resistant to change.
 - 9- They are diverse.
 - 10- They sometimes have to compensate for age issues (Kuhne, n.d.).

The experiential learning process is important for adult learners. It uses active participation on part of the learner, allowing them to engage in activities, critically review the activity, obtain insight from their analysis and then apply their experience in a practical situation (SHRM, (n.d).

This is based on the 4 steps of Kolb's Experiential Learning Cycle:

- 1- Concrete experience
- 2- Observation and reflection
- 3- Forming abstract concepts
- 4- Testing in new situations

In training the new Maersk employee, it would be best to allow them to incorporate Kolb's learning cycle in their training. It would give them invaluable hands on experience with the opportunity to assess themselves while receiving constructive feedback from their preceptor. This can be done one on one, or in a group with several different personalities that would allow the employee to experience simulated instances of actual job interactions. The simulations could be set up in the following way:

- Simulation 1 – A transaction or claim with an existing customer that is easy to please.
- Simulation 2 – A transaction or claim with an existing customer that is difficult to please.
- Simulation 3 - A transaction on a B2B basis.
- Simulation 4 – A conversation with a competitor's marketer.
- Simulation 5 – Build a relationship with a new customer.
- Simulation 6 – Negotiate a contract with another business.
- Simulation 7 – Resolve a customer conflict.
- Simulation 8 – Using Microsoft Suite, design a power point presentation of the first 7 simulations to present at a team meeting.
- Simulation 9 – Using Microsoft Excel, create a market analysis spreadsheet.
- Simulation 10 – Give your version of the life-cycle of a successful shipment.
- Simulation 11- Interact successfully with other personnel (drivers, service people, etc).

One thing that is vital to take into consideration is that Maersk will be dealing with an adult learner. This involves a very specific style of teaching, as the adult learner has very specific characteristics as opposed to the young student:

- 1- They want to have more control over their learning experience.
- 2- They draw on past experiences to learn.

This is just a few examples of learning activities that the employee could participate in as a part of their experiential learning. The activities would be spread out over the course of several days. There would be a period of constructive feedback and opportunity for self-assessment following each simulation so that the experience is fresh in the minds of both the employee and the preceptor. After the simulations were complete, the

Maersk employee would have more than that initial abstract idea of what would be expected of them on the job.

III. MANAGING AND APPRAISING EMPLOYEE PERFORMANCE

Every mature organization should have a performance evaluation system in place. Ideally the performance evaluation is done annually. Done correctly, it levels the employee playing field and affords organization hierarchy a comprehensive view of which employees are most valuable to the company (Bell, 2018). The performance evaluation is beneficial to everyone in the organization. It documents employee performance over the course of the year. It reinforces the role of the employee so everyone is clear on exactly what is expected. It aids in self-development and allows the employee to give their own feedback and work with management to improve skills. It is a motivator. It is a structured process for employees to discuss various issues with management. It clears a pathway for short and long-term goals. It statistically monitors success of the company's recruitment and induction practices. It gives management the ability to make decisions about raises, bonuses, promotions, etc. It makes it easy to recognize underachievers. It provides chronological documentation of any changes down through the years for both employee and manager to review and discuss (KPI, 2018). Human resources management plays a key role in performance evaluations by keeping the process fair, accurate, and well managed. They do this by ensuring that there is no discrimination in the process. One of the ways of doing this are calculating various demographics such as age and gender. According to Bell (2018), a fair work environment boasts a relatively diverse selection of top ranking employees. Another thing that human resources management does to promote fairness is its own evaluations of management within the facility to ensure that each manager is using the same system of evaluation as approved by the company, and that they evaluate each employee based on the same standards.

Not every performance evaluation is going to a good one, or what the employee or even manager expected. The employee may believe that they are doing a good job, but the manager may believe otherwise. This could cause for a tense relationship between the employee and the manager. This is where human resources becomes the mediator to improve that relationship. They can set up both individual and group meetings to come to a mutual agreement on how to proceed in the future.

Finally, human resources management provides security and confidentiality of performance evaluation records. They are stored in a secured computer database and viewed solely on a need to know basis (2018).

There are many instances where employees and managers often view the performance evaluation process as just another box checking chart they need to fill out during the course of the year. This attitude does nothing for the organization's strategic plan to fulfill its mission and reach its goals. Instead, this should be a time to evaluate. Are the employees as a whole just muddling through, pushing long hours with heavy workloads? What can be done to make them work smarter and more efficiently? An employee who's done their work properly in their slotted (let's say 8) hours is much more likely to show up and put

in another good performance the following days as well. The employee who is all over the place with an unreasonable workload, putting in 14, 16 hour days are going to quickly burn out and be unable to continue performing their duties in a capable manner. That is why it is the job of human resource management to ensure that performance aligns with the organization's strategic plan. Six steps have been identified to set up this alignment:

- 1- Set achievable goals.
- 2- Commit to regular monitoring
- 3- Continuing education for performance improvement.
- 4- Ensure strong leadership.
- 5- Use appropriate software.
- 6- Integrate with formal learning (Freifeld, 2013).

There are three different types of employee appraisal systems: Trait, behavioral, and results-based. A trait based system focuses on the employee's personal attributes such as punctuality, helpfulness, and reliability. Many employers will incorporate these attributes into a checklist using options such as, "does not meet standards", "meets standards", "exceeds standards". Much of the time, a trait based evaluation is subjective, based on the manager's perception of the employee. This could impact the overall reliability of this section of the evaluation (Griffin, 2018). Below is an example of a trait based evaluation that could appear on a performance review.

Traits	Does not meet standards	Meets standards	Exceeds standards
Punctuality		X	
Sincerity			X
Reliability		X	
Helpfulness	X		

Punctuality can be determined simply by revisiting the time clock log. Sincerity, reliability, and helpfulness are more subjective. One could ask, "If the employee exceeds standards on sincerity, then how do is it that you deem them unhelpful?" The manager could answer, "Well they seem really nice and they mean well, but they tend to keep to themselves and not help others". A fellow coworker might say that they find that employee to have been very helpful in the past, but seem overly nice and are fake in their sincerity.

A behaviorally anchored rating system (BARS) rates the actions of the employee using a graphic rating scale which ranges from excellent to poor (2018). Again, the results can be subjective as they are based on the manager's perception of the employee's success in their actions. A system such as this one is often used in organizations where customer care is the focus. Categories could include things such as, "Answers the phone in an appropriate manner, in accordance with training", "Follows up with customer to ensure satisfactory experience", and "Customer information verified and documented accordingly" (2018). Below is an example of a behavior based evaluation that might appear on an employee review.

Behavior	Poor	Fair	Good	Excellent
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Answers the phone in appropriate manner, according to training. Follows up with customers to ensure satisfactory experience. Verifies and documents customer information. Keeps accurate record of all customer based transactions.		x	
		x	
			x
			x

and effectively administers aerosolized medications to patients throughout facility.		
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This type of chart could appear on the evaluation of an employee who works in a distribution center. According to their manager, their performance is average in some areas and above average in others.

Results based performance appraisal systems is also known as management by objectives (MBO). This is a method of evaluating employee performance by “examining the extent to which predetermined work objectives have been met” (Archer North, 2010). Here, employees are judged by actual outcomes rather than their potential or someone else’s opinion on how they’ve performed. This is achievable because the results are tangible, not perceived as they are in trait and behavioral based performance evaluations (2010). An example of this can be any place of employment where the employees must demonstrate knowledge of procedures or equipment. Below is an example of a results based performance evaluation for a respiratory therapist who works in a hospital.

Results	Criteria met	Criteria not met
Draws arterial blood and effectively analyzes using I-Stat.	x	
Understands, explains and effectively applies mechanical ventilation to critically ill patients.		x
Understands, explains, and effectively applies BiPAP to borderline critically ill patients.	x	
Explains, understands use,	x	

Above is a sample of a results based appraisal not unlike one that is filled out by respiratory managers annually. This sample could be indicative of a newer employee who has spent working most of their time in routine care and hasn’t yet learned mechanical ventilation, which would be necessary to advance to critical care. This is not necessarily a bad thing. In fact, it highlights a goal for the employee to work toward.

In the case of Maersk’s new CARE Business Partner, primarily, a behavioral scale would be best suited to evaluate the performance of the employee who fills this position. Much of the job responsibilities include customer care and partner relations, so good employee behavior is essential. Included in this evaluation would be:

- Acts as customer’s primary point of contact.
- Advocates for the customer
- Works with customers and various business partners for total 360 degree satisfaction
- Builds strong, lasting customer and business relationships
- Helps to resolve customer claims
- Ensures smooth shipping process from start to finish

A smaller results based scale would be useful here as well to evaluate proficiency. Such points would include:

- Demonstrates full understanding of claims policy and its impact on the company
- Demonstrates full understanding of KPI’s and acts in line with set targets.
- Demonstrates full understanding of Maersk policy, procedure, and bottom line.
- Demonstrates full understanding of the life cycle of the shipping process and transportation as a whole.

Several different types of performance rating scales can be used within organizations, including graphical, letter, and numeric scales. The graphical scale helps management quantify employee behavior. Ratings are usually done on a scale of 1-5, 5 being the best score. This should be used for behaviors rather than ambiguous, subjective traits. (MBASkool, 2017). Such factors could include teamwork, sense of responsibility, and quality of work. An example of a graphical rating scale, according to MBASkool (2017) is:

- 1- Poor. Underperformer. Repeats rather than corrects mistakes.
- 2- Average. Work is sometimes neat; sometimes untidy.
- 3- Good. Mostly consistent in doing acceptable work.
- 4- Very good. Reliable performer who consistently does good work.
- 5- Excellent. Consistently high quality work without errors.

Letter scales, also known as essay scales, provide an employee evaluation in letter or essay form. This can be used for either trait or behavior assessment, and is basically a series of questions about the employee that must be answered in essay, or

letter form. It can include employee strengths, weaknesses, comments about past performance, etc. This can be done effectively only if the manager has good written communication skills (University of Minnesota, n.d.).

Finally, there is the numeric rating scale. This is the most commonly used scale because it is easy to use, highly effective, and allows for a broad range of assessments. It is customizable by the organization to rank characteristics in the order of importance, normally on a scale of 1-5 or 1-10 (Lopez, 2015). It is typical for the lower numbers to represent unsatisfactory conduct and the higher numbers to represent satisfactory employee conduct (2015). This type of scale is beneficial because it allows the employer to determine if an employee's overall performance is poor, fair, good, or excellent.

IV. COMPENSATING EMPLOYEES

Employee compensation is defined as a benefit package that an employee receives in exchange for a service they provide. Compensation is typically the largest expense an organization bears, and can include cash pay, bonuses, paid time off, retirement plans, various types of insurance, commissions, and disability, among other things (McKinney, 2018). Six different types of compensation plans have been identified and are as follows:

- 1- Straight salary compensation. This is the basic salaries/wages given to an employee.
- 2- Salary plus commission. This is known as one of the most reliable types of compensation. Here, a base salary is given to the employee as well as additional pay based on performance.
- 3- Commission only. This is usually used in sales. Basically, the employee must perform or they will not receive pay.
- 4- Territory volume compensation plans. This can be used employees work in teams, based on profits acquired per territory.
- 5- Profit margin/revenue based compensation plans. This is a very popular type of compensation based on profits made by the business.
- 6- Residual commission. Here, commission is received by the employee so long as the employee's account generates business for the organization. This type of plan is idealistic according to the employee, and is not widely used (The HR Digest, 2017).

Employee benefits are a type of compensation provided to employees in non-wage form, in addition to their wages and salaries. Examples of these include employee housing, child care, insurance, tuition reimbursement, vacation time, personal time, and retirement plans (Wikipedia, 2009). According to Wikipedia (2009), the purpose of employee benefits is to provide financial and economic security to its employees to improve worker retention within the organization. The combination of compensation and benefits is often referred to in the business industry as C&B. Such packages give employees incentive to do better work and to stay with the organization. They boost workplace morale and make the employee feel valued.

A compensation philosophy is a formal statement of the organization's position on employee compensation. It typically

explains why they are going to pay their employees in a particular manner as well as setting up guidelines to promote consistency (SHRM, 2018). They are usually set up by a company's human resource department. Maersk has established guidelines for incentive pay for the Board of Directors and management. According to the Danish Companies Act section 139, no board member will receive incentive or performance pay. They will instead, receive a fixed annual salary. However, the company does use incentive arrangements "secure a high degree of alignment of interests between the company's Management Board and the shareholders to strengthen attraction/retention and to promote and support value creation both in the short and long term" (Maersk, 2017). Maersk incorporates both short and long-term cash incentives for its employees as well as stock options and adjustment and repayment of incentive based on remuneration.

Maersk's short-term cash incentives were established to promote achievement and high performance. Their philosophy is "pay for performance", whereby a cash bonus would be paid upon achieving set financial goals, the Maersk group's total results, or other non-financial goals such as exceptional safety, leadership, and engagement (2017). This short-term cash incentive would be paid out annually.

Maersk's long-term incentives are focused on correlating long term top performance and achievement, and include stock options, which would be granted annually and are focused on long term improvement of Maersk's stock price (2017).

Today's competitive market does and should influence any organization's compensation philosophy. Maersk wants to attract people to join them, motivate its employees to perform at their highest level according to their skill sets, and recognize competitive market pay so as to attract and retain current employees. Since Maersk primarily deals in sales and relationship building, it is appropriate to implement incentive based pay because the employees know that the better they perform, the more money they are going to make. The long-term benefits kick in when building more contacts and partnerships, hence generating more business for Maersk. These are partnerships that could last a lifetime and flourish. These employees could be given stock options, as they have made an almost infinite contribution to the company – One that will likely last even once they retire. Here is where residual commission has a potential to generate as well.

Market competition is not only something to be considered, but something that is to be actively involved in if an organization is going to be successful in retaining top talent. People want to go where the money is and where they feel appreciated for their efforts. A salary survey should be conducted at least annually, if not quarterly, and answered by the human resources department. This is especially true since the economic recession of the early 2000's, when many employees' raises were frozen and salaries were decreased. It is the responsibility of the company's HR department to know what these positions are, who the people are retaining them, and what similar companies are doing to compensate similar employees. This is where the salary survey can be very useful. It is a chance for the HR department to reflect on three very important questions:

- 1- How much can the company afford to overpay a position?

- 2- How long will top talent stay with the company if they have reason to believe that their current salary is not market competitive?
- 3- How easy would it be for market competitors to lure good workers away? (HRN, 2014).

The United States has, in many ways, recovered from the recession. Unfortunately, many employers haven't resumed employee raises or adjusted salaries accordingly. The salary survey keeps the HR department ever vigilant of those who may be surpassing them in market value. For example, a nurse might be working for a hospital where she hasn't seen a pay increase in 4 years. The nurse is a top performer and has been there for 18 years. They come in early and stay late when requested. They help their coworkers. They are kind, compassionate and knowledgeable with patients and their families. They often go above and beyond what is expected of them, yet no raise in 4 years. One night after work, the nurse looks online at other hospitals in the area and notices that brand new graduate nurses are starting out at \$4.00 less/hour than it's taken them to make in 18 years. The nurse talks to the manager and HR, but they will not budge. The nurse starts applying to those other hospitals. This hospital, had their HR department participated in more salary surveys, may have been able to avoid losing a seasoned veteran nurse to a competitor. What's more is that they may have difficulty replacing this nurse if a new graduate sees that other hospitals will pay them several dollars an hour more than this hospital. Further, other employees may stand up and take notice. They know that Nurse B has accepted a job elsewhere, making \$5.00 more an hour. They may decide to follow suit. This would be in detriment to the company, more so than if they did their market research and paid their staff accordingly.

It has been established that competitive salary is essential to retain top talent within an organization, but what about benefits? Discretionary benefits are those that the law does not require an employer to provide (Martin, 2017). These types of benefits fit a broad spectrum, but can include things such as child care, health insurance, dental and vision coverage, pet insurance, a 401 K plan, a pension plan, tuition reimbursement, substance abuse counseling, and paid vacations (2017). These are certainly valuable because they improve workplace morale and motivation. However, they are very expensive for the employer. A discretionary benefit package offered by Maersk once upon a time, pre-globalization, might not have been feasible. However, since the company has exponentially grown, it is almost necessary to provide them. Maersk wants top talent. One way to attract top talent is by wooing them with all the extra "perks" they will receive – Health insurance including vision and dental, child care for employees who are parents of younger children, a retirement plan, a pension plan, life insurance, short and long term disability, paid holidays off, vacation and personal time, perhaps a company car, cell phone and tablet, especially for the marketers whose job is to travel and communicate with Maersk associates. These are all extremely important for a globalized company – One who can afford to give stock options to long term top performers – To offer to each and every one of its employees. One thing that would be more financially feasible for both Maersk and its employees is to allow the employees to build their own benefit package. This way, the employees only pay for exactly what they want, reducing their monthly payroll

deduction, and reducing the amount that Maersk has to pay into it as agreed upon. Discretionary benefits and keeping abreast of market competitors will help Maersk's HR division retain its top talent and attract even more on a global level.

Globalization is defined as "the process of integrating a business's operations and strategies across a wide array of cultures, products and ideas" (Bradley, 2018), and it affects human resource managers in the way of employee issues including diversity, legalities, and overall development. According to Bradley (2018), there are 5 main functions of global HR management to promote shared values throughout an organization. They are as follows:

- 1- Recruitment process. Having the right teams in place within the organization is crucial in elevating its profile, running smoothly, and of course, turning profits.
- 2- On the job training. Even the most qualified individuals need to learn how things are done within the organization for which they are employed. It is HR's responsibility to provide this training. When such training is provided across global locations, it provides for better communication and consistency.
- 3- Professional development. There should always be opportunity for growth, whether it comes in the form of seminars, webinars, or cross training opportunities. It's been shown to increase employee sense of worth and motivation.
- 4- Benefits and compensation. This is a very important HR function for globalized organizations because "it requires a sensitivity to the wants and needs of a diverse group of people (2018).
- 5- Ensuring legal compliance. It is imperative for the HR department of a globalized organization to stay abreast of different labor and tax laws, as they can not only be numerous, but vary globally (2018).

Human resource departments are also responsible for aligning their practices and theories to their organizations' visions, missions, and business. The vision of the organization tells the tale of what the organization wishes to be in the future. The organization's vision set forth by HR provides a clear guideline for decision making that will help achieve this goal. It is not only important for future goal achievement, but it also instills a sense of pride among the employees who help the company achieve this vision down through the years. It is a source of inspiration (Wikibooks, 2013).

A mission statement, not to be confused with vision, defines the organization's reason for existing. It should identify its customers, its services/products, and its global locations (Entrepreneur, n.d.). The mission statement set forth by HR not only speaks to customers, but to employees. It tells them how committed the department is to the things they feel are important to the organization.

An organization's business carries the purpose of commercial enterprise. Within the globalized organization lies a group of people working toward the same commercial interest of providing customers with their products/services. The business can be either for profit, or non-profit. It is the role of the HR department to create a hierarchical structure that "establishes roles and positions within the company" (LaMarco, 2018).

At the top of the human resource department hierarchy lies the human resource manager. This person is responsible for the planning, direction, and coordination of the administrative functions within the company. Their job also includes recruiting, interviewing, and hiring staff, developing them professionally, strategizing with administration, and bridging the gap between other managers and the organization's employees (Bureau of Labor Statistics, 2018). There are also different types of HR managers – Employee relations managers, payroll managers, and staffing managers (2018).

The employee relations managers have an important role as they oversee company policy. They handle legal issues, grievances, wages, union issues, benefits, etc. Payroll managers ensure that payroll is done correctly, and in a timely manner. Staffing managers recruit and hire talent, ensuring that the best possible candidates are placed in appropriate positions throughout the organization (2018). All of these things line up to the organization's strategic plan, which essentially "sets priorities, focus energy and resources, strengthen operations, ensure that employees and other stakeholders are working toward common goals, establish agreement around intended outcomes/results, and assess and adjust the organization's direction in response to a changing environment" (Balanced Scorecard Institute, 2017). The plan is placed in writing by the HR manager and is used throughout the organization to communicate goals.

Work environments have changed quite dramatically down through the years, and it is the responsibility of the human resource department to adapt to these changes and to set policy to honor them. For instance, last century, many women entered the workforce. Previously, there were so many male dominated professions. HR departments, in order to ensure a smooth and safe working environment, and to avoid legal disputes, had to set policy for things such as sexual harassment, which was not much of an issue in an organization filled with men. Back then, gay men weren't exactly eager to announce their sexual preference for fear of being harassed or even fired or physically assaulted. So sexual harassment in the workplace was never really a big issue. Another thing that emerged into our society is affirmative action and political correctness. There was a point in time where it was no longer okay to discriminate against someone due to gender, race, or religion. HR policy again had to be updated in correlation. Labor laws have changed. Organizations can no longer hire children under the age of 16. Also, depending on the state in which an employee lives, the employee cannot work X amount of consecutive hours. For example, in Pennsylvania, it is illegal for an employee to work longer than 16 hours, and after the 16 hours, there must be an 8 hour break before they can work another shift of any length. This is something that I know from experience. The point is, HR concepts and principles must be kept modern and up to date. Many factors can cause changes in the work environment, but analysts have identified two key factors:

1- Greater pressure for an organization to be a "lean enterprise", or more competitive, agile and customer focused. This involves defining value according to the customer, identifying things that can be done to increase that value, and eliminating anything that is identified as waste.

2- The IT and communication technology boom that has allowed work to be done in places other than inside the facility – In other words, many employees now have the freedom to work from their computer or cell phone in any location they choose, including home (Heerwagen, 2016).

Not only have things changed for the organizations themselves, but for the people within them. Today, workers are expected to demonstrate more cognitive, social, and interactive competence. They need to know more and do more. The numbers of departments within organizations have decreased over time. For instance, at one time, there might have been a certain smaller hospital that employed both cardiology techs and respiratory therapists. Due to budget cuts, now respiratory therapists are expected to do both their job as well as the cardiology techs' job, and they are expected to do it seamlessly. Employees are also expected to work in teams at times, which can involve working through conflict and developing an understanding for one another, whether there are personal differences or even cultural differences. Heerwagen (2016) also speaks of a new "psychological contract" between employer and employee – An informal mode of understanding what each expects of the other. This new contract focuses on professional development, continuous education, and work/life balance. The old school contract focused more on job security and upward mobility within the company – Neither of which are guaranteed any longer due to a number of reasons. For one, companies have gotten so big that they don't care as much about the individual employee any longer. This fosters a reduction in loyalty on behalf of the employee. Again, it is here that HR steps in to bridge the gap between the employees and the head of the company so that the employee may feel valued and in turn, be more loyal and committed to the organization. Perhaps they work with the employee for more flexible hours. There are a number of things that must be considered and implemented by every modern Human Resource department to not only decrease employee turnover, but to align its concepts to the organization's strategic plan.

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AUTHORS

First Author – Andrea Disanferdinand, Southern New Hampshire University, Andrea Disanferdinand, 128 Philadelphia Avenue, West Pittston, PA. 18643, Email: andrea.disanferdinand@snhu.edu

A novel model for comparing Peak Ground Acceleration derived from three attenuation laws using an integrated GIS technique in Sabah area, Malaysia

Ratiranjana Jena, Biswajeet Pradhan

* Centre for Advanced Modelling and Geospatial Information Systems (CAMGIS),
Faculty of Engineering and IT, University of Technology Sydney, NSW 2007, Australia

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Abstract- Ninety percent of major earthquakes of the world directly indicating the sources of subduction and collision zones with shallow, intermediate, and deep focus earthquakes. The state of Sabah not indicating a high seismic risk zone and not directly associated with the Ring of fire. Nevertheless, it is positive towards seismic risk as the state experienced more than 65 earthquakes. However, no attention of researchers on comparative analysis of PGA map recorded in literature. Therefore, this study conducted; 1) to analyze the earthquake hazard and active tectonics of Sabah using PGA map derived from three methods and; 2) to understand the intersection of faults that can create isoseismic elongation. More than 90% of earthquakes are shallow and focused at a hypo-central distance of (0 ~ 100) km as resulted from this research. Therefore, Sabah had been experienced a highest magnitude of ~6.3, which can create the maximum PGA values of ~ (0.075, 0.06 and 0.08) based on three different attenuation equations proposed in this study. These earthquakes can produce a maximum intensity of (MMI~7) that is derived from the resulted PGA values. The study on active tectonics explains about the major 12 active faults and their intersection relationship. Therefore, this whole study has been conducted based on three attenuation relation to find out the best method for preparing the PGA map and the stereo net plotting using an integrated GIS technique.

Index Terms- Earthquake; PGA; attenuation model; active tectonics; GIS

I. INTRODUCTION

The generation of seismic waves are due to earthquakes that can be resulted from the fault movement or from any other sources. There are many ways to measure various earthquake aspects. However, magnitude is the most common one that has been used for size measurement. There are many scales used for the magnitude measurement out of which, four magnitude scales popularly used to calculate magnitude that are globally accepted such as; Mb, Ms, Ml and Mw. Because of the limitations of all three-magnitude scales (ML, Mb, and Ms) more uniformly applicable magnitude scale, known as the moment magnitude

or Mw was developed. Nevertheless, Mw is mostly used in various countries to find out the exact magnitude of an earthquake. In general, damages to buildings are depends upon PGA (Peak ground acceleration) and PGV (Peak ground velocity). Therefore, it has been recognized that the frequency of ground motion significantly depends on the characteristics of lithology of the site (Bazzurro and Cornell, 2004; Borcherdt, 1994).

Many scientists and researchers have investigated from various perspectives about the problem of amplification of ground motions by using probabilistic approaches (Lee et al., 1998; Tsai, 2000). Seismic amplification due to ground motion is the important and fixed problem can be found in every seismically active zones. Therefore, equations of ground-motion prediction has been developed for the classification of sites (Fukushima et al., 2007). Campbell found that the intensities resulting from reverse faults are more than that of normal and strike slip faults (Dowrick 1992; 1999). (Chavez & Prestley, 1985) proposed the Mo Versus Ml relationships for the (1980) Mammoth Lakes, California Earthquake as a base for conversion of magnitudes. However, It is described that the body waves originally contributes the seismic damage and ground amplification resulted by multi reflection formed due to SH-wave (Von thun et al., 1988; Sato et al., 2004). For the soil classification, the important parameter is the average shear velocity on the top 30 m of the ground surface (Barani et al., 2008; Akkar and Bommer 2007; Choi and Stewart 2005). Therefore, due to loose sedimentary deposits shear waves amplification happens, that causes the strong ground motion.

Malaysia is a country coming under low seismic zone. However, in the state of Sabah, local earthquakes can be found in various parts originated from large local faults. It was reported by USGS (US geological survey) that Sabah had experienced some earthquakes with highest magnitude of 6.5 on a Richter scale. Malaysia is located on a stable block called Sundaland and that is the southern edge of the major Eurasian plate (Simons et al., 2007). Continental collision between Indian subcontinent and Eurasian plate genuinely affecting the block (Simons et al., 2007). However, this block includes not only Vietnam, Thailand and Malaysia but also the Sunda shelf, Borneo, Sumatra and Jawa. The major faults that can be found in western Sabah (MOSTI, 2009) are mostly responsible for high magnitude of

Recent studies have shown that earthquakes in Ranau area are attributed to the two intersecting faults i.e. Mensaban and Lobou-Lobou (Mohammed 2012). These fault zones are active as an evidence from past earthquakes and ground deformation has resulted in extensive damage to infrastructures in this area, specifically to schools and teachers quarters (Mohammed 2012). Peak ground acceleration (PGA) is defined as the maximum ground acceleration that occurred during earthquake shaking at a location. Therefore, this is the big problem in Sabah to categorize the site based on the ground motions and there is no comprehensive analytic model for PGA map preparation and comparison. Therefore, we proposed a novel model to choose the best method for the PGA mapping that could provide good quality results. The designed model is also able to model the fault plane solution of large regional faults of Sabah.

In this study, we have ensemble various attributes to investigate ground motion from the probabilistic point of view. Our study focusing on the PGA map preparation for the Sabah. Nevertheless, our proposed method is to make an effective comparison between various attenuation models to derive the PGA map. This model tests three global attenuation models for PGA mapping. Comparative assessment of the PGA mapping is reliable and effective to find out the accuracy, quality of PGA maps and to understand the strength, limitations of all the models. The aim of this research is to identify the best model for PGA mapping and the focal mechanism analysis in Sabah.

II OBJECTIVES

- Graphical investigation of events to find out the relationship between depth, distance and magnitude.
- To develop PGA map according to three attenuation laws and comparative analysis.
- To execute MMI calculation from the PGA values resulting from the three attenuation laws.
- To analyze active fault mechanism and tectonics from fault data using stereo net and beach ball diagram.

III. STUDY AREA

Sabah is located in the north of the isle of Borneo. In Sabah, between Ranau and Mount Kinabalu there are at least two active regional fault zones exist that intersect each other. Sabah of Malaysia has experienced more than 65 earthquakes with the highest magnitude of 6.3. The state of Sabah is the highly hazardous region for earthquakes as compared to other parts of the country. It is lying at a lat. and long. of 40 to 70 and 1150 to 1200, respectively. The tectonics of Sabah pointed out that variety of faults and a large number of lineaments, which can be found in different parts of the state. However, not all the local faults that can be found in Sabah are active. Nevertheless, 12 major and large active faults can be found in the hilly regions that are intersecting to each other. Various types of lithological soils and rocks such as volcanic sediments, basin sediments, limestones, sandstones, philitic rocks, gneiss and granites characterize the study area.

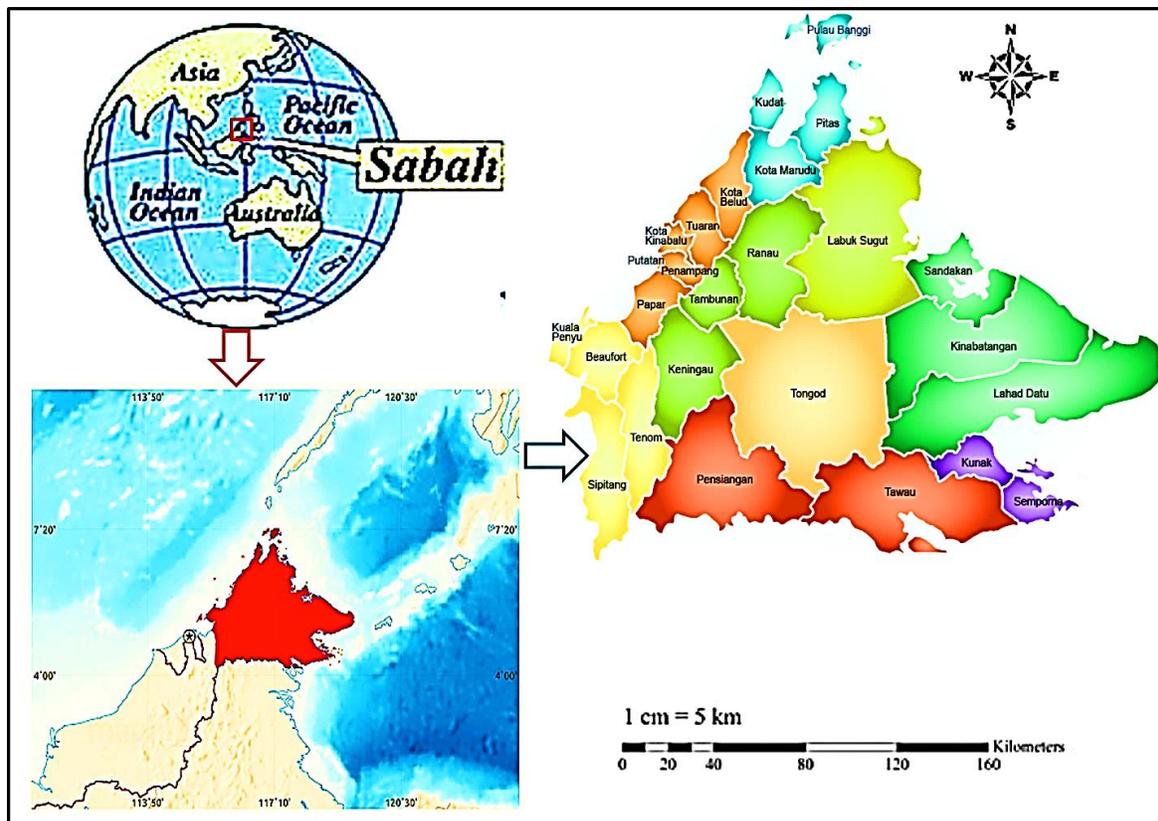


Figure 1. Represents the study area of Sabah, Malaysia

IV. MATERIALS AND METHOD

Earthquake data has been collected from the USGS (US geological survey) and ISC (International seismological center) in a proper way. Geological data has been collected from the geological map published in the journals. Firstly, data were arranged in a proper scientific manner in excel sheet. In next step, various calculations has been outperformed to apply in three attenuation models. Those earthquakes with magnitude below 3 were not considered for the PGA calculation. Because low magnitude earthquakes cannot shake the ground through which, destruction can happen. PGA map can be prepared by using the designed methodology as well as the comparative analysis can be outperformed. The proposed methodology inclusively used three attenuation equations. The distance (D) can also be calculated to apply in attenuation models for PGA calculations. Therefore, D value can be calculated by the formula;

$$D = (E^2 + 7.3^2)^{0.5} \quad \text{Eq (1)}$$

Where, E = Epicentral distance
 M = Earthquake Magnitude

Table 1. Types of attenuation models used for PGA analysis.

ID	Source	Laws
1	Joyner & Boore-1981	$10^{(0.249*M - \text{Log}(D) - 0.00255*D - 1.02)}$, $D = (E^2 + 7.3^2)^{0.5}$
2	Campbell- 1981	$0.0185 * \text{EXP}(1.28 * M) * D^{(-1.75)}$, $D = E + 0.147 * \text{EXP}(0.732 * M)$
3	Fukushima & Tanaka- 1990	$(10^{(0.41 * M - \text{LOG}10(R + 0.032 * 10^{(0.41 * M)) - 0.0034 * R + 1.30})) / 980$

The estimation of (PGA) peak ground acceleration by using the event magnitude, source-to-site distance, environment and tectonic sources will be reliable. Various types of attenuation relationships are developed for the major research of seismic hazard analysis. Such relationships have been proposed as well as the comprehensive reviews also been published in peer reviewed journals (Boore and Joyner (1982), Campbell (1985), Joyner and Boore (1988), Abrahamson and Letihiser (1989), Fukushima and Tanaka (1990)). Most of them are well developed by using various regional and worldwide data acquired through the arrays of strong motion. We applied the general equation of regression models proposed by Campbell (1985), Joyner and Boore (1988) and Fukushima and Tanaka (1990).

The MMI (Modified Mercali Intensity) can be calculated by using the formula,

$$MMI = 1/0.3 * (\log_{10}(PGA * 980) - 0.014) \quad \text{Eq (2)}$$

Where PGA unit is G.

It is feasible to understand the changes in values of MMI resulting from three attenuation models. The whole process has been working out as per the designed methodological flowchart. In the first step, graphical investigation of various attributes of earthquakes need to perform. In next step, by using the attenuation laws, PGA and MMI need to be calculated. From there, PGA density map can be prepared. By using the geological map, different lithological units have been extracted and assigned factor values to each units. Developing the amplification factor map from geological map and amplification values are also performed. By multiplying the amplification factor map with the PGA density map, the PGA map can be derived. In next step, using the data of active faults and stereo net the fault plane mechanism can be understood and types of faults can be identified.

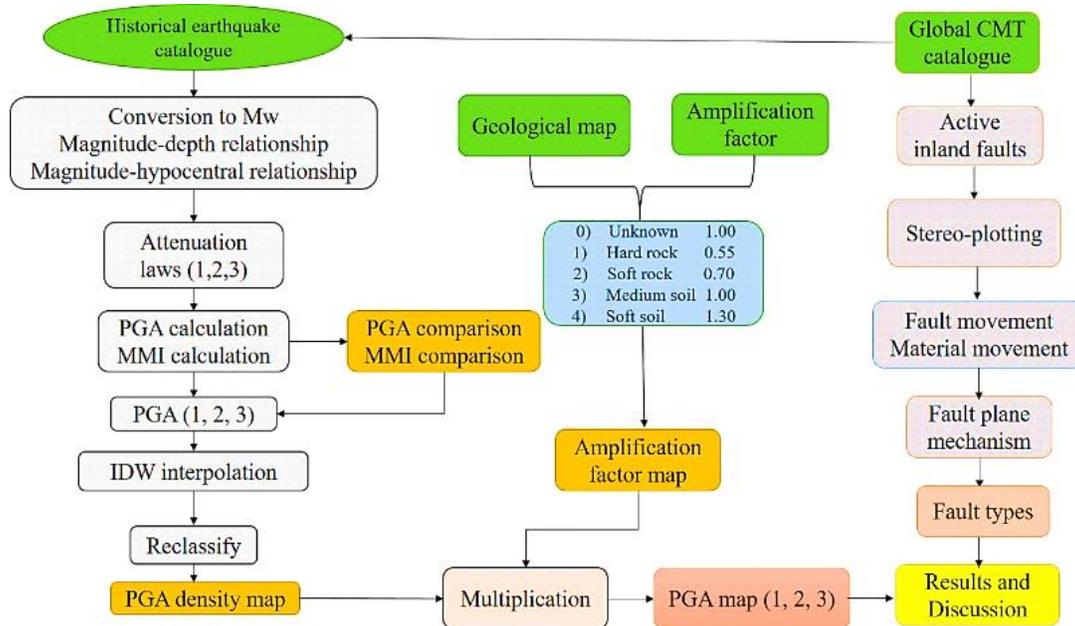


Figure 2 represents the overall methodological flowchart of the study.

V. RESULT AND DISCUSSION

The earthquakes experienced in Sabah, Malaysia recorded by the three seismic stations are resulted because of local active faults. The magnitude of all the earthquakes were recorded in Mb. However, it is not effective and good magnitude to estimate the size of earthquakes. Nevertheless, Mw is the moment magnitude, which is much reliable to estimate the size of earthquakes. Therefore, conversion of Mb to Mw is important to find out the changes in magnitude value. Because it is inclusively, evaluate the values based on the fault length, depth and slip. The model

derived between magnitude and depth explains that more than 90% of earthquakes experienced in Sabah are shallow focus earthquakes and these earthquakes are happening at a depth of 0 to 60 kilometer. Nevertheless, in this area very less intermediate or deep focus earthquakes have been experienced. The second model clearly shows that most of the earthquakes happening at a particular hypocentral distance of 0-200 km. Therefore, very less earthquakes happened at a distance of approximately 100 km from the site.

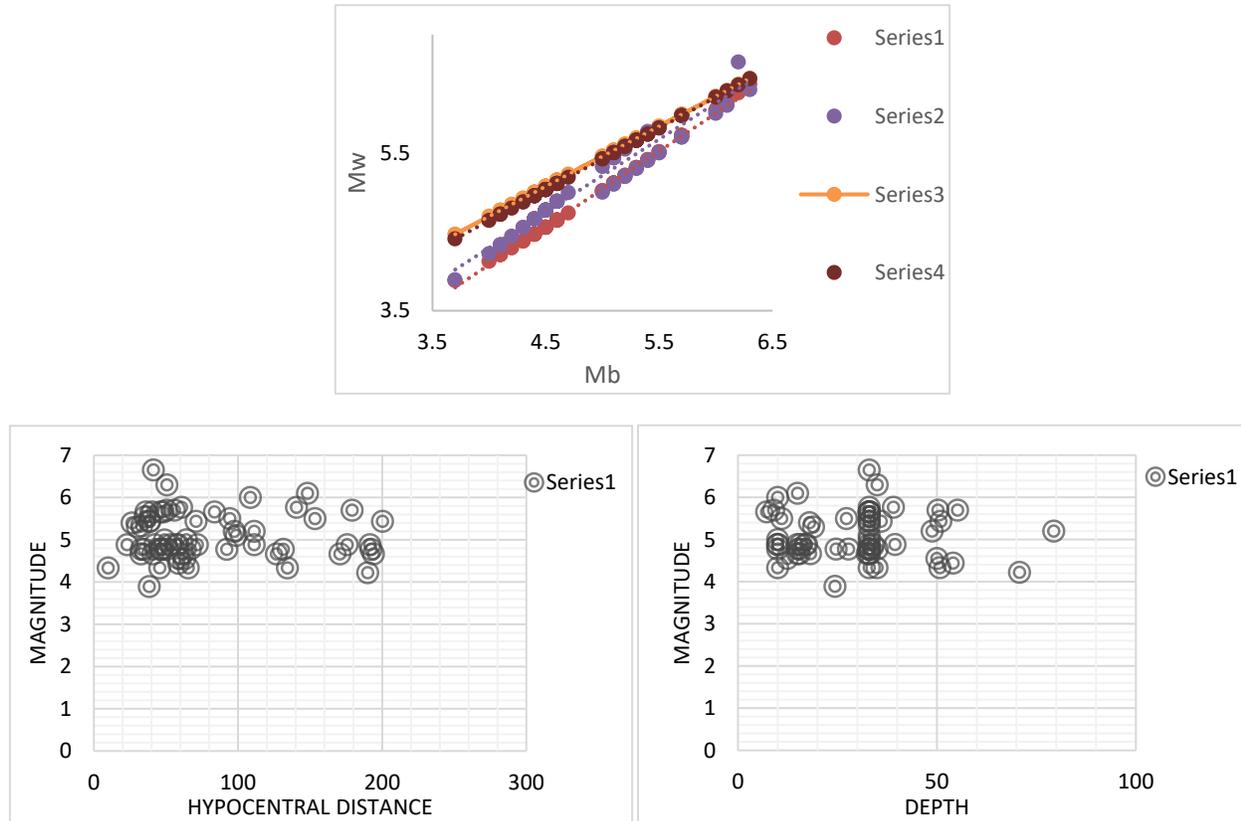


Figure 3 Graphical relationship between various attributes of earthquakes.

A. PGA calculation and comparison

As we know, the applicability of the distance to Sabah from the surrounding seismic sources as well as the events magnitude and the depth information for the PGA calculation. Therefore, it possible to make an estimation of the Peak Ground Acceleration of rocks in Sabah as a result of these events. Generally, Input parameters for the earthquake scenario are location, depth, magnitude and occurrence time. The relationship between PGA, epicentral or hypocentral distance and magnitude can be estimated by using an attenuation function. In the RADIUS method, PGA can be calculated using three attenuation formulas:

Joyner & Boore (1981), Campbell (1981) or Fukushima & Tanaka (1990). All the results are presented in the figure 4.

All these three models have been compared by plotting in a single model, which clearly explains that there is a huge difference between series one and the series two. At a particular time period, these two methods developed but in between these two methods, the series one is much better for the PGA analysis. Series three can be found in between the series one and two. However, it follows other two attenuation series. Therefore, third method is also effective for the preparation of PGA map.

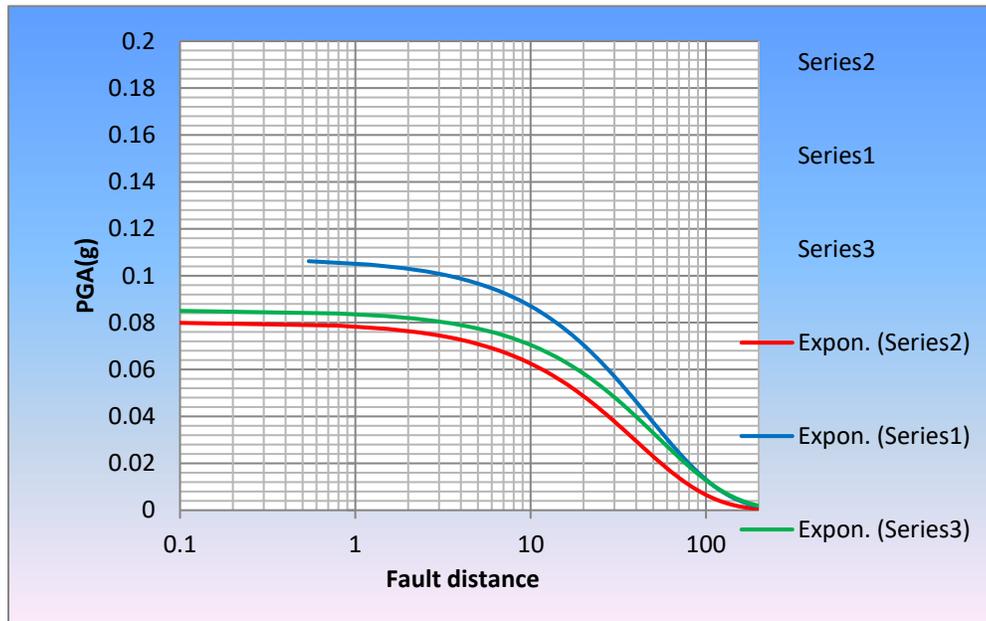


Figure 4. PGA calculation and plotting with fault distance.

B. Comparison of MMI calculated from PGA

It was important to investigate the intensity or the level of destruction that can be possibly happened due to an earthquake of four or more. In order to convert the PGA values to (MMI) Modified Mercalli Intensity, the general relationship of Trifunac & Brady (1975) is applied, which is reliable for the study. Therefore, the level of destruction can be understood clearly

from the MMI map. Nevertheless, only MMI calculation has been outperformed to investigate the quality of results. Therefore, the models are presented graphically. PGA to MMI conversion can be done from the above method and applied as the intensity map for the study area. These three models explain about the PGA and Intensity relationship. MMI-1 and MMI-2 are almost looks similar and the values are approximately equal but the results of MMI-3 is quite different from the other two models.

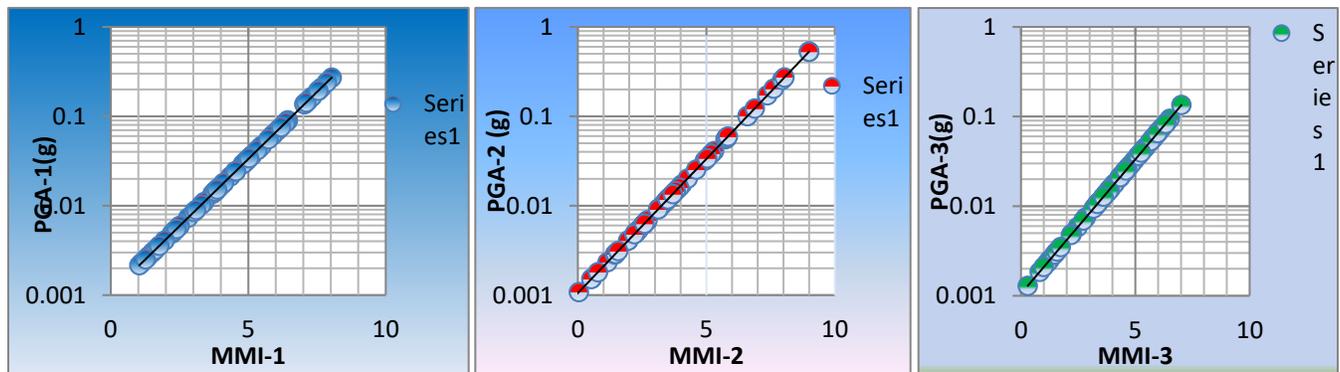


Figure 5. Represents graphically the PGA vs MMI.

C. PGA density Comparison

PGA density map has been derived by using the IDW interpolation method and used for the comparative analysis. PGA density map represents the density of PGA values resulted from the attenuation models by using the earthquake events and site distance from the source of faults and earthquakes surrounding Sabah. PGA-1 and PGA-2 density map seems to be similar while the PGA-3 density map looks quite different from others.

Therefore, by considering the entire factors PGA-1 density map seems to be better than other two. Red color of the maps shows highest PGA values and the yellow, green color shows the medium and lowest PGA values. These PGA interpolations have been performed by IDW interpolation technique because of appropriate results than the Spline interpolation.

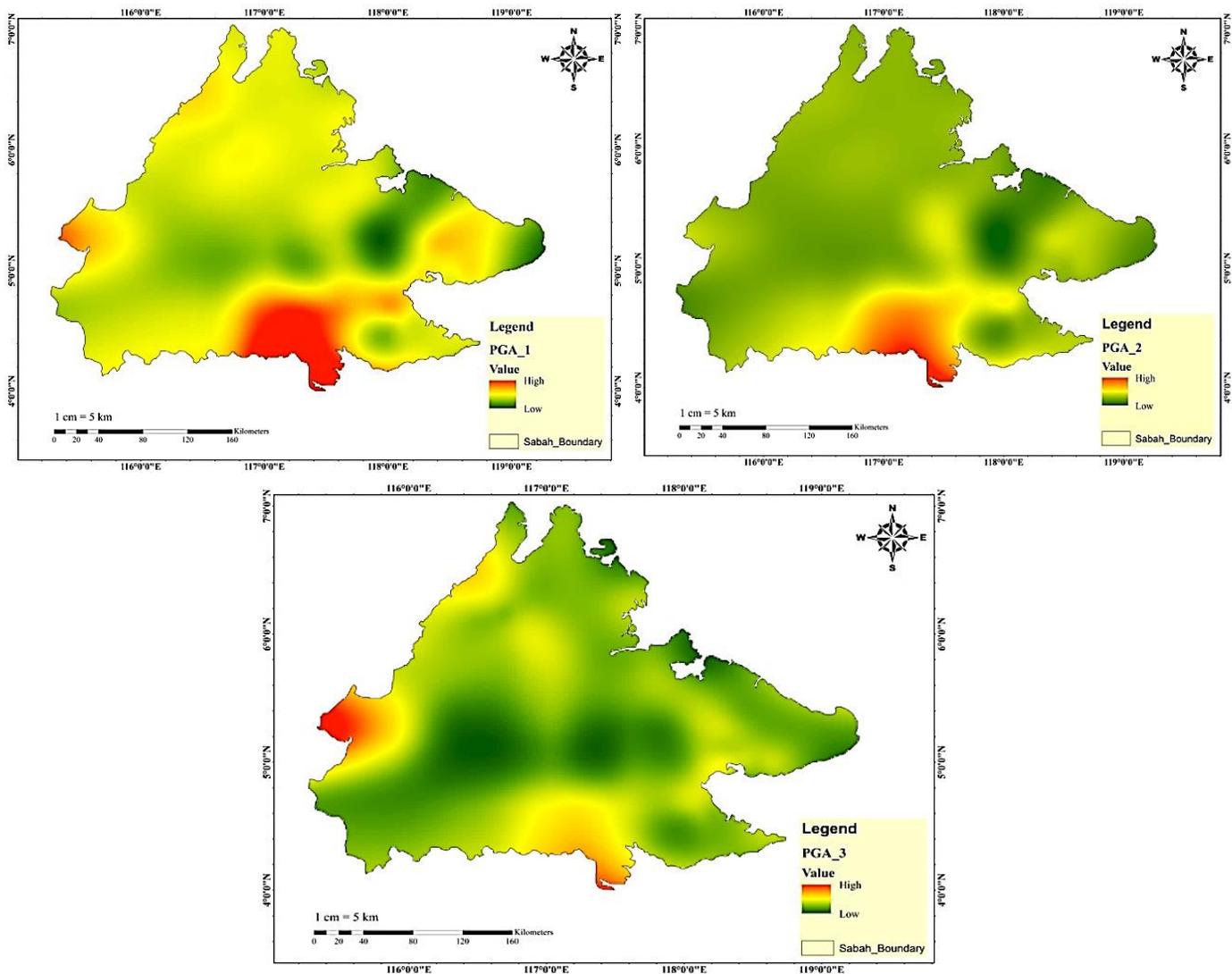


Figure 6. PGA density map for the Sabah using three attenuation models.

D. Amplification factor map

In order to verify the reliability of the amplification factors calculated in this study, shaking maps are derived for the destructive earthquakes occurred. The dynamic character of ground due to seismic waves simply depends on various types of lithology. Seismic waves amplify the ground if the materials are

recent sedimentary deposits (mostly soils and loose sedimentary rocks). Firstly, Preparation of lithological map from the geological map of Sabah was performed.

In the next step, assigning some particular values to different rocks based on amplification types and rock types. These values called as amplification factor values. Then reclassifying the map according to the amplification factor values to make the amplification factor map, which is very much useful to prepare

the PGA map. Therefore, in the figure 8. total area is divided into four classes based on amplification factors. Classified map is

characterize by (0.5-V.Low, 0.5-0.7-Low, 0.7-1-Medium, and 1-1.3-High).

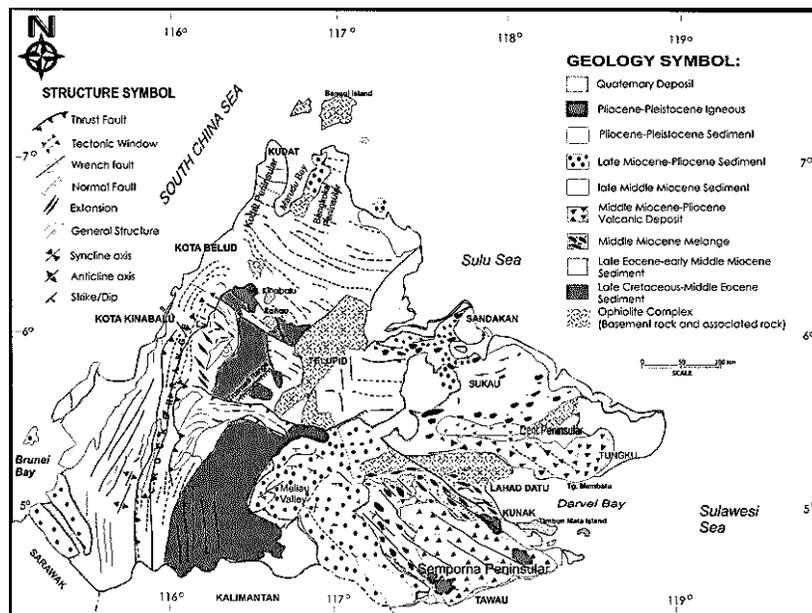


Figure 7. Geological map of Sabah, Malaysia

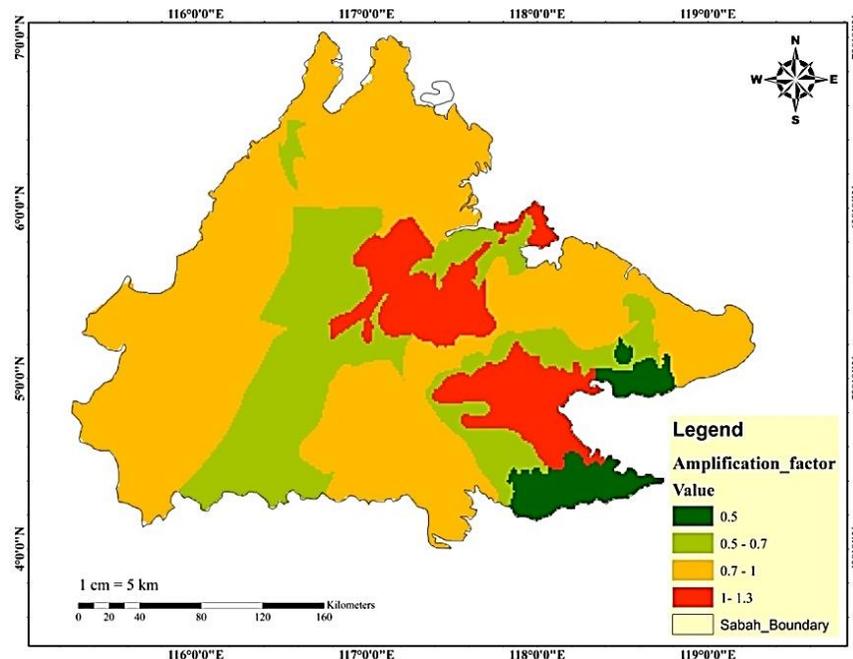


Figure 8. Amplification factor map from lithology

E. Comparative analysis of PGA maps

A simple method, followed by the RADIUS methodology, in which Peak Ground Acceleration is calculated for a scenario earthquake and the amplification of soil, is treated by simple multiplication values. PGA map have been prepared using three attenuation laws presented in the methodology. PGA density map

was prepared first and then the PGA map by using the amplification factor value for various rock types. PGA-1 and PGA-2 are approximately similar but there is a very big difference in between the PGA-3 with the other two. The red areas in the map shows the high PGA values while the yellow one shows medium. Derived PGA map generally depends on the amplification factor of various lithology of the study area. The

PGA map resulted from the third equation is much better than other two because of effective values. Producing earthquake ground-shaking scenarios has become a common practice in earthquake research and development in the last decade. These PGA maps, which can be found within a few minutes of an experienced earthquake via the various Web portals or communication sites, are useful for public and scientific consumption. PGA maps are most important, for planning of emergency response, recovery and assistance during a destructive earthquake. Generally, the reliability of PGA maps depends on several factors such as, the ground-motion equation used to

estimate the shaking attenuation laws as a function of event magnitudes and distance. The geological map used to provide an estimation of the average shear wave velocity V_S , in the upper 30 m, and site correction factors adopted to account for amplification effects produced by particular soil conditions. Based on types of soil and rocks the amplification factors are categorized and added into the database to apply for the preparation of factor map, which was finally used for the PGA map development in next step. Therefore, the models are derived here by proposing the PGA comparison model are correct with good accuracy and effective.

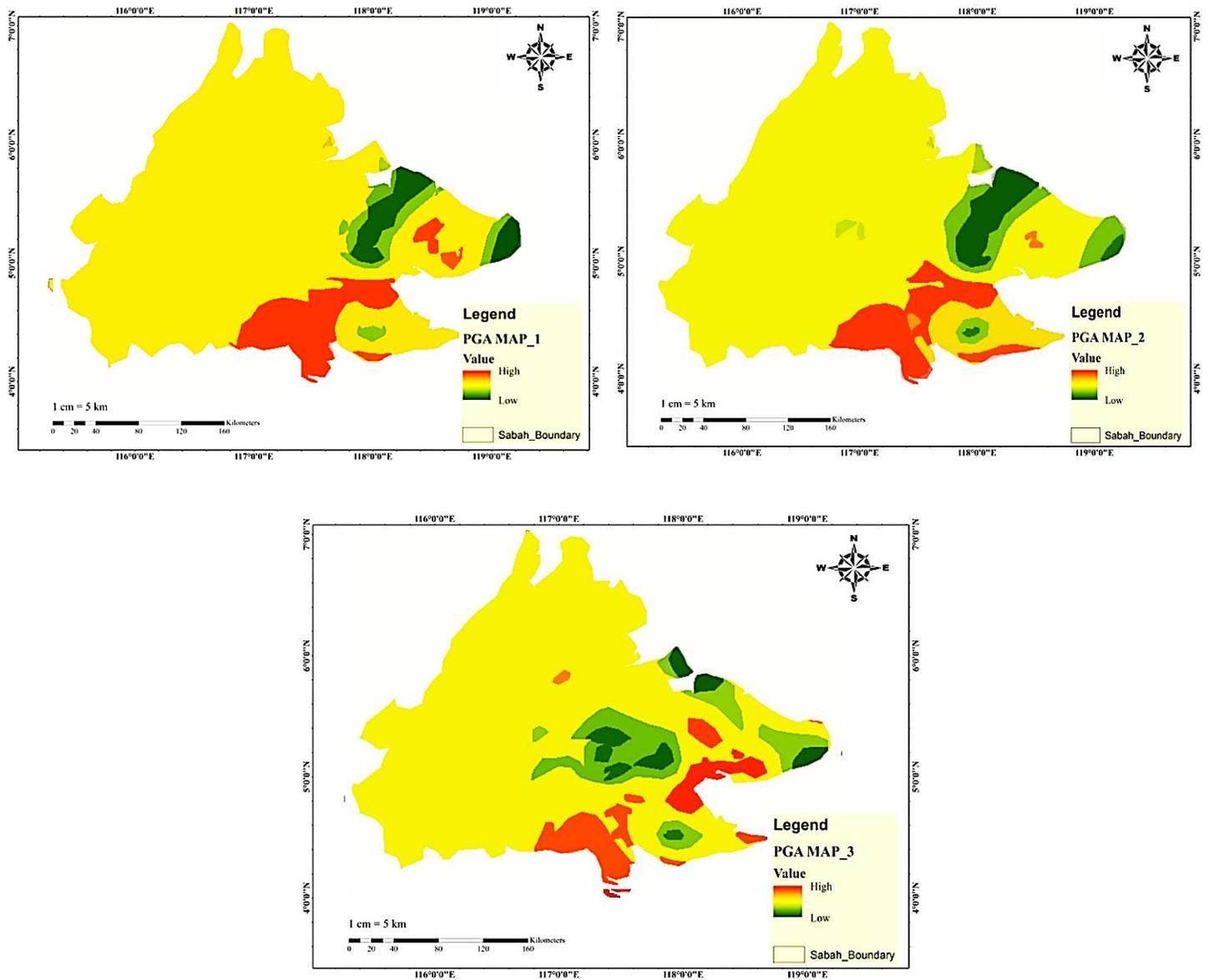


Figure 9. Comparative analysis of PGA maps.

Table 2. Represents the PGA and MMI values resulted from the study.

PGA Values	MMI Values	Remarks
PGA-1(0.075)	MMI-1(7)	Damageable
PGA-2(0.06)	MMI-2(6)	Negligible damage to well-developed infrastructure
PGA-3(0.08)	MMI-3(7)	Damageable

F. Stereo plot of twelve active faults of Sabah, Malaysia

Faults can be represented through the stereo net for a better understanding. Therefore, almost 12 active faults are plotted in the stereo net with dip and strike of all faults. All the faults are active in Sabah resulting medium magnitude of seismicity and these are major local faults, which are very much responsible for most of the earthquakes. All the 12 active major faults plotted in stereo plot representing the fault mechanism. Most of the earthquakes can be found at the intersection of faults and lineaments. All the 14 faults explains about the fault movements, strike, slip, compression, tension and it also describe about the kind faults are present in Sabah. Most of the faults are reverse faults that are producing high magnitude of earthquakes. Fault plane solutions are derived for all the faults to understand the

active mechanism in Sabah. Material movements can be clearly understood from all the fault plane solutions presented in the figure 10. All the solutions derived using stereo net and to validate the resulted beach ball diagrams from the stereo net plotting the details of information can be found in the Global Centroid-Moment-Tensor (CMT) Project (<http://www.globalcmt.org/>). Again, the same models are also derived from Arc-GIS, which are plotted at the right side down of each model to confirm the results are correct. These models are useful to understand the tectonics of the study area. This modelling of fault plane solution can also be performed by using the first P-wave motion, which is not our main interest in this project. Our main interest is to understand the tectonics of the active faults in Sabah that can be clearly understood from these fault plane solutions.

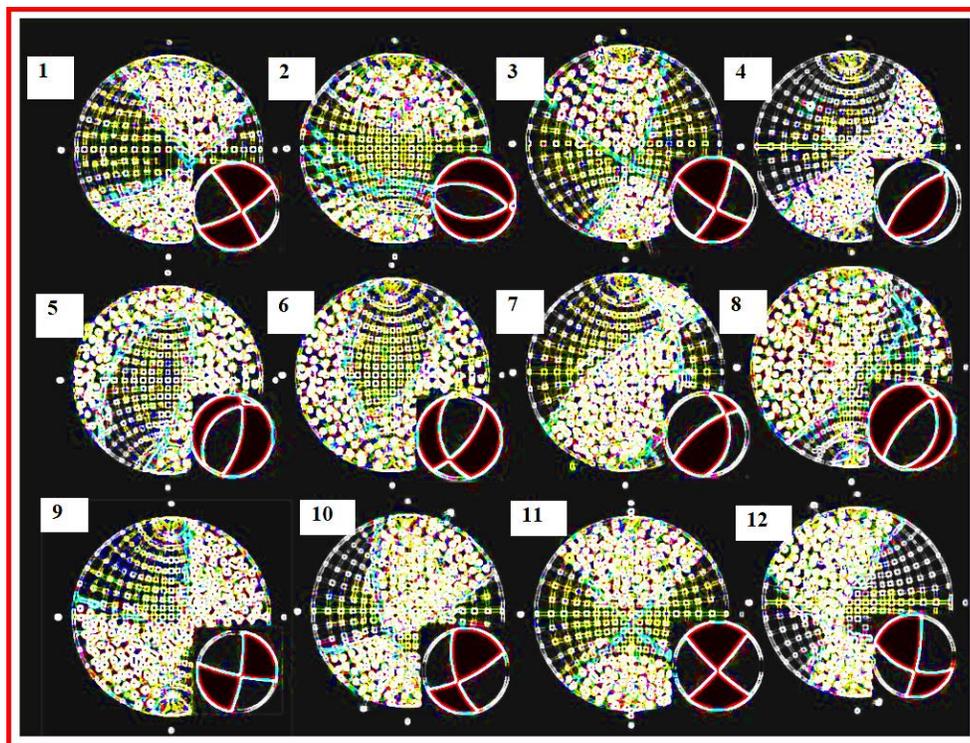


Figure 10. Fault plane solution for 12 active inland faults of Sabah.

VI. CONCLUSIONS

All the earthquakes experienced in Sabah area are mostly shallow focus as resulted from the analysis of magnitude and distance relationship. Generally, the earthquake magnitudes are converted to the best size measuring magnitude to make an effective result, while applying in the attenuation laws. PGA values resulting from the three attenuation laws are well expressed in graphs. The results interpreted from the graphs shows the best method that can be applied for the Sabah. PGA maps are resulted using all the three attenuation models and compared to find out the best one. PGA map prepared from equation 3 is the best method for this study based on, (a) Lithology and amplification factor (b) Magnitude of earthquakes and (c) Fault System. By analyzing the results of PGA map it is quite clear that equation 1 and 2 are almost similar, while the results from equation 3 is different from others. The patches of intersection of faults, earthquake magnitudes, and the types of lithology clearly indicates that possible area of highest ground acceleration. Therefore, by analyzing and considering all the factors it is clear that the equation 3 is the best one for the PGA map preparation in Sabah. By making a very effective analysis on faults using stereo net plotting fault movement, compression and dilation can be clearly understood. Beach ball diagrams are presented to understand the fault mechanism as well as the types of active inland faults that are present in Sabah. The overall design of the method is unique and effective for the PGA comparison. The strength and limitations of the developed model is totally depends on the types and completeness of data used. The model is providing very realistic results to make a useful comparison between PGA models. The method is cost effective, feasible and accurate.

Acknowledgement

The earthquake and fault data collected from Global centroid moment tensor (GCMT). Figures were prepared by using ENVI and ArcGIS 10.4 and Excel

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AUTHORS

First Author – Ratiranjana Jena, University of technology Sydney

Second Author – Biswajeet Pradhan, University of technology Sydney

Languages and National Identity: Relevance of Dialect in Hausa Regional Identity

Dr. Abdullahi Sarkin Gulbi*, Dr. Umar Ahmed*

* Department of Nigerian Languages, Usmanu Danfodiyo University, Sokoto, Nigeria.

** Department of Modern European Languages, Usmanu Danfodiyo University, Sokoto, Nigeria.

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Abstract- Dialect refers to regional variety of language with differences in vocabulary, grammar as well as pronunciation. Dialect therefore is a kind of variation that exists in the use of language from one part of the region to the other that shares the same language. A language without dialect is in the verge of extinction. Hausa language is very rich in terms of number of speakers that uses the language across the Hausaland and beyond. This makes the language to be a lingua franca and as such has various dialects. The Hausa scholars classified Hausa dialect into Western and Eastern dialects respectively. This paper therefore is aim at exploring the relevance of Hausa dialect in Hausa regional identity. The methodology to employed in carrying out the research is by careful observation of the use of dialects by the respective speakers of Hausa dialectal regions.

Index Terms- Language, Regional Identity, National Identity, Dialect.

I. INTRODUCTION

Hausa is a language with the largest number of speakers, spoken in Benin, Burkina Faso, Cameroon, Ghana, Niger, Nigeria, Sudan and Togo. Hausa serve as a lingua franca in West African Countries. It belongs to the West Chadic languages subgroup of the Chadic languages, which in turn is part of the Afro-Asiatic language family. Scholars are of the view that Hausa major dialects can be classified into Eastern, Western, Northern, and Southern Hausa dialects. Eastern dialects are Kananci, Bausanci, Dauranci, Gudduranci and Hadejanci. Western Hausa dialects are Sakkwatanci, Kutebanci, Katsinanci, Arewanci, and Kurhwayanci. Katsina is transitional between Eastern and Western dialects. Northern Hausa dialects are Arewanci for Arawa. Then Zazzaganci in Zaria is the major Southern dialect Ahmad (1992:13). The paper is therefore intended to make a critical analysis of the relevance of Hausa dialect in Hausa regional identity.

II. LANGUAGE DEFINED

Language is defined by various scholars and researchers; as such it is defined in different ways from different perspectives. According to Sapir (1921:7) defined language as purely human and non instinctive method of communicating ideas, emotions and desires by means of a system of voluntarily produced

symbols. But Muhammad (2011:3) as cited in Thirumalai (2003) viewed language as a system of arbitrary vocal expression by means of which members of a social group interact with each other. Going from the above definition one can therefore opined that language is verbal or written as well as a semiotic form of expression through which human being can communicate ideas and emotions which also serve as their identity.

III. THE CONCEPT OF DIALECT

Dialect refers to the variation that exists in the use of language by the speakers of the same language living in different location, Sani (2009:2). Yahaya (2013:106) argued that dialectical variation is refers to the different varieties of language spoken in different geographical location or by different categories of speakers of language based on age, gender and social status. Hausa Dialect therefore as termed by linguist is refers to the variety of a language that is characterizes of a particular group of the language speakers which is sometimes applied to regional speech pattern cause as a result of geographical, social as well as linguistic factors.

IV. CLASSIFICATION OF HAUSA DIALECTS

Hausaland covers much part of Northern Nigeria outside the middle belt and Borno. But also extends to the north of Kano and Katsina provinces. It also covers north and West of Sokoto down to Southern part of Niger Republic.

There are numerous distinct Hausa Dialects both in the northern states of Nigeria as well as in the republic of Niger. Most of the dialects centers on the major cities. For instance, in the northern part of Nigeria, we have Kananci which is widely spoken in Kano which is the north central part of Nigeria. We also have Sakkwatanci spoken in Sokoto, further to the north of Kano is where Katsinanci is spoken with concentration of speakers in Katsina. Immediately to the south of Kano, Zazzaganci dialect is spoken with concentration of speakers at Zaria.

Dauranci centre around Daura which is north of Kano and East of Katsina, while Bausanci and Gudduranci centre around Bauchi state.

On the other hand, the dialects spoken in the Republic of Niger include Damagaranci which is spoken in Damagaram (Zinder) a city located to the northern part of Kano. We also have

Gobiranci spoken in Gobir (Tsbiri) directly west of Sokoto while Arewanci is spoken in Dogon Douthi which is situated east of Niamey and Kurfayanci is spoken in Kurfey (Filingi) north of Niamey. Other Hausa dialect with very small population in Niger can also be found include; Kyanganci spoken in Gaya and Agadanci which is spoken in Agadez.

Apart from the above dialect survey in Hausaland, some scholars are of the view that dialect of Hausa can best be categorized into Western and Eastern dialects respectively. Western dialects include Sakkwatanci, Katsinanci, Kurhwayanci and Arewanci which are spoken in Sokoto, Katsina, Kurfey, Dongon Douthi and Maradi respectively. While Eastern dialects of Kananci, Dauranci, Bausanci, Guduranci and Zazzaganci spoken in Kano, Daura, Bauchi and Zaria respectively.

In contrary to above category, Ahmad (1992:13) opined that Major Hausa dialects can be group into;

- i. Western Dialects- Sokoto, Tawa, Zamfara and Kabi
- ii. Eastern Dialects- Kano, Hadejia, Azare, Katagum Misau, Jama'are etc.
- iii. Northern Dialects- Katsina, Maradi, and Zinder.
- iv. Southern Dialects- Zaria and Bauchi

From the above arguments one may deduced that present of dialect in any given language shows the richness of vocabularies and other lexical items in that particular language in question. This leads to having variation in the usage of language by the same speakers of language.

V. REASONS FOR THE EMERGENCE OF HAUSA DIALECTS

Languages survive and spread globally as their uses move from one point to the other. Therefore reason for the spread of dialects in any given language is obvious. That is even the reason why linguist opined that a language without dialect is at the verge of extinction and possibly endangerment.

Some of the reasons for the emergence and the spread of Hausa dialects include;

- i. **Migration:** Simply mean movement of people from place of origin to the other as a result of trade, work, and search for Knowledge and quest for adventure etc. People tend to change their attitude toward their language as a result of acculturation from either side; as such the issue of dialect may arise.
- ii. **Geographical Factors:** Physical barriers like mountains, rivers and thick forest usually separate people of the same language from having direct contact to each other and create barrier of communication between them. When this happened, the possibility of having a language variety within the language is paramount.
- iii. **Grammatical/ Linguistic Factors:** This is the principal reason for dialect, hence the essence of dialect is to have different varieties of words and phrases in the language so as enrich the language in question. Therefore speakers tend to develop their language in vocabulary and sentence construction.

iv. **Social Factors:** Social status of speakers often create language gap in the use of language. For example the speech of the rulers is different from that of their masses, because rulers tend to speak with fairness and choice of words.

v. **Environmental Factors:** This is where the issue of assimilation arise, whenever there is a contact of two or more speakers of different languages, then the minority will face the threat of assimilation. The majority language will be at the advantage of getting new varieties of words, hence dialect will developed.

VI. RELEVANCE OF DIALECT IN HAUSA REGIONAL IDENTITY

Before we embark into detail discussion let us look at the concept of regional variation and identity in language. Regional variation in language more especially Hausa is what brought about the issue of dialects which are characteristics features most widely observed while spoken the dialect.

Identity in language is refers to the situation where part of a person's identity is not only concern with the country he belong to but also concentrated on the region he live. As such this type of identity is a sense of belonging similar to that of national identity but in a smaller scale. For example, if one was asked where he was in Hausaland? He would simply reply, Sokoto, Maradi, Katsina, Zaria, Bauchi, Dogon dutsi, Kano or any of the major cities of Hausaland, as such; every region in Hausaland is expected to use a specific dialect for their identity.

Therefore the native language of any community is its identity; hence identity is very important for the social and psychological well-being of the individual or group of people. Identity gives an individual a solid sense of who he is even in the plural context. Therefore without an indigenous language, it is difficult to sustain the cultural identity of the people in the region Usman (2014;13)

In trying to support argument of the paper, the two broad category of dialect will be analyzing (Western and Eastern dialects). Our analysis will be carried on the basis of morphological and syntactical processes in comparison with the standard Hausa dialect.

Western Dialect: These are dialects of Sakkwatanci, Katsinanci, Kurfayanci, and Arewanci spoken in Sokoto, Katsina, Kurfey and Dogon Douthi respectively. There are features that distinguish them from the conventional or standard dialects of Hausa as shown in the following examples; **W.D** (stand for western dialects) while **S.D** are for standard dialects respectively.

1. Western Dialects are identified with the use of /h/ (hw) sounds instead of /p/ or /f/ sounds.

W.D	S.D	GLOSS
Hwarii	farii	white
Hita	fita	go out
Hwatarii	fatarii	skirt

2. Use of /sh/ sound as the third person singular possessive pronoun suffix instead of **sa**. E.g,

W.D	S.D	GLOSS
Wandonsi	wandonsa	his pant
Agogonsi	agogonsa	his watch

3. Use of singular pronoun **shi** for subjective pronoun instead of pronoun **ya**.

W.D	S.D	GLOSS
Shi karanta	ya karanta	that he read

4. Use of third person plural relative perfective form

W.D	S.D	GLOSS
Munka	Muka	Plural Relative Pronoun
Sunka	Suka	”
Kunka	Kuka	”

5. Western dialects have more frequent germination (doubling of consonants).

W.D	SD	GLOSS
Zowwaa	Zuwaa	Coming
Kassuwa	Kasuwa	Market
Jakki	Jaki	Donkey

Now let us consider various dialects of Hausa with their distinctive features that make them unique and identical in nature.

- i. **Sakkwatanci dialect:** This dialect is very rich in terms of vocabulary and number of speakers utilizing the dialect. There are a specific sounds which are present in Sakkwatanci but absent in other dialects. Example consider the following consonants sounds /sw/ in swahe, /lw/ in lwatsi, /hw/ in hwawa, hwara or hwaruku etc.

Sakkwatanci	S.D	GLOSS
Swaha	Safe	Morning
Swabo	Sabo	Sin
Hwara	Fara	to begin
Hyade	fyade	to rape

The moment you came across a speaker pronouncing the above words you will begin to think that he is from Sokoto region (dialect). Apart from word construction, even in Sentence construction we sometimes heard Sokoto people in their utterances saying for example;

Sakkwatanci	S.D	GLOSS
1. Eh wallah!	Wallahi	Swear to God
2. Au wallah!	Wallahi	Swear to God
3. Musa yana bakin diga.	Musa ya je bakin titi	Musa is by the road
4. Wandanga dalibai hazikai na	Wadannan daliabai hazikai ne.	The students are hard working.

- ii. **Katsinanci:** The dialect share some common features with Sakkwatanci, but is unique in the use of /ts/ sound, more especially when the sound/ts/ appear or proceed the vowel /i/ or /o/. Example;

Katsinanci	S.D	GLOSS
Katchina	Katsina	Town Katsina
Tchogwami	Tsegumi	Gossip
Tchokana	Tsokana	Challenge
Tchintuwa	Tsintuwa	Discovery

- iii. **Arewanci:** The is spoken in Dogon Douchi of Niger Republic, the distinguishing features of the dialect can be seen in their mode of sentence formation. For instance;

Arewanci	S.D	GLOSS
Zaa ni tahiyaa	Za ni tafi	I will travel
Ya tahiyaa	Ya tafi	he has gone
Ya fara hanya	ya tafi	he has gone
Tahoo ka yi mini bagire. Zo ka raka ni		Let's go

- iv. **Kurhwayanci:** The share some features with Sakkwatanci dialect, this may not be unconnected with the closeness of the two regional dialects, or as a result of richness of vocabulary of Sakkwatanci. For example,

S.D	Sakkwatanci	Kurhwayanci	Gloss
Sauri	Samri	Samri	fastness
Muka	Munka	Munka	perfect pronoun

- v. **Zamfaranci:** This is a sub dialect of Sakkwatanci spoken in some part of Zamfara State. There are some features that distinguishes it from Sakkwatanci and standard dialects. For instance;

S.D	Zamfaranci	Gloss
Aure	anre/amre	Marriage
Mu wuce	Mu wucekke	let's go
Wuce	Wucekke	go

Now let us go back to the Eastern dialect and examine their common features in identifying their region as follows;

- a. **Kano Dialect:** The most striking features of Kano dialect is the speed at which the are making an utterance, they usually economize words while speaking the language. For instance;

S.D	Kananci	GLOSS
Mene ne?	Mee?	What is it?
Kai Wane ne?	waye?	Who are you?
Kada	kar	not to
Ya ce	ice	he said
Bari na fada maka	Bara na gaya maka	let me tell you.

- b. **Dauranci:** Dauranci dialect lack /sh/ Sound, instead they replaced /sh/ with /h/ or /hy/ sound. Example;

S.D	Dauranci	Gloss
Reshe	rehe	Branch
Shuka	hyuka	breed
Nishadi	nihyadi	entertained
Shiga	higa	entry

- c. **Bausanci:** They lack /c/ and /ts/ sounds in their dialect, instead they replaced /c/ with /sh/ and /ts/ with /s/ respectively. E.g

S.D	Bausanci	Gloss
Ciki	shiki	stomach
Zuciya	zushiya	heart
Cikini	Shiniki	trade

- d. **Gudduranci:** This is the dialect spoken in Misau, Jama'are, Katagum, Gwaram and Birnin kudu. They speakers of this dialect lacks /j/ instead they replaced it with /ʔ/ sound. For example;

S.D	Gudduranci	Gloss
}ofa	ʔ ofa	door
}afa	ʔafa	leg
}waro	ʔwaro	insect
ba}i	baʔi	black

- e. **Zazzaganci:** The main feature of Zazzaganci is the absent of gender distinction in the dialect. Consider the following examples;

f.

S.D	Zazzaganci	Gloss
Matata	matana	my wife
Motata	motata	my car
Wandona	wandona	trouser
Hulata	hulana	cap
Kekena	kekena	bicycle

Zazzaganci also replaces U with A in the treatment of names beginning with Un. Example,

S.D	Zazzaganci	Gloss
Unguwa	Anguwa	Area
Ungulu	Angulu	Vulture

VII. CONCLUSION

As we have seen, the paper has critically assessed the relevance of Hausa major dialects in Hausa regional identity. In an effort to support our argument, the paper has attempted to reveal the concept of dialect and its classification as well as the reasons for emergence and the spread of dialects in Hausaland. The paper therefore has attested that regional dialects play a role in regional identity as suggested in our general survey of Hausa major dialects. The paper also admits that every region in Hausaland has its own dialect for its socio-cultural identity.

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AUTHORS

First Author – Dr. Abdullahi Sarkin Gulbi, Department of Nigerian Languages, Usmanu Danfodiyo University, Sokoto Nigeria., asgulbi@gmail.com, 08089949294
Second Author – Dr. Umar Ahmed, Department of Modern European Languages, Usmanu Danfodiyo University, Sokoto Nigeria., ummaru@gmail.com, 07031569155

Five-Stage Axial Flow Compressor for Gas Turbine

Khema Theint

Department of Mechanical Engineering, Technological University (Kyaukse)

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Abstract- The goal of this paper is to calculate the blade design of axial flow compressor. Main objective of the compressor usage is to compress the fluid and to deliver higher pressure than its original pressure. So, the stagnation pressure ratio and overall pressure ratio are calculated in this paper. Blade mean diameter is 0.295 m for all five stages. The number of blades for each stage calculated in this paper is 82 blades for first stage, 90 blades for second stage, 117 blades for third stage, 175 blades for fourth stage and 307 blades for fifth stage. In this study, inlet flow rate is 20451 CFM, outlet flow is 2811.427 CFM, compressor horsepower is 1060 hp, polytropic head is 255.649 kNm/kg and efficiency of compressor is 91.83%. And then, the general performance curves of axial flow compressor are described based on the inlet flow rate, pressure ratio and head. When these performance curves are compared with the original performance curve of axial flow compressor, the curves are nearly similar. So, the design calculation results of axial flow compressor are satisfied.

Index Terms- gas turbine, rotor, stator, blade design, axial compressor

I. INTRODUCTION

Axial compressors are compressors in which the fluid flows mainly parallel to the axis of rotation. An axial compressor comprises a number of stages as determined by the required overall pressure rise. Each stage includes a rotating row of blades (rotor) followed by a stationary row of blades or vanes (stator). The rotor blades impart momentum to the fluid thus increasing the total energy of the flow and propelling the fluid along the axis of the machine. The stator vanes convert much of the fluid momentum into pressure energy so that a rise in the static pressure across the stage occurs whilst the mean axial velocity of the flow through the stage is approximately constant. The angles of the blades and vanes relative to the direction of flow are critical to the pressure rise and operating efficiency of a stage.

II. DESIGN CALCULATION OF FIVE-STAGE AXIAL FLOW COMPRESSOR FOR GAS TURBINE

A. Design Calculation Of Blade Design For Axial Flow Compressor

An axial flow compressor used in gas turbine engine has constant axial velocity throughout the compressor of 152 m/s, blade mean velocity of 162 m/s and it is delivered 10.5 kg of air per second at a rotational speed of 10500 rpm. Reaction ratio is 50 % for each stage and the work done factor is 0.92. Stage efficiency and polytropic efficiency is 84 % and 87 %. Stagnation temperature rise for each stage is 15°K. Inlet stagnation temperature and pressure is 288°K and 1 bar. Blade aspect ratio and pitch-chord ratio are 3 and 0.5. In this research, the design data of axial flow compressor used in gas turbine engine is picked up from the Ta Dar Oo airway in Myanmar.

Axial flow compressor has the following known data;

Constant axial flow velocity, C_a = 152 m/s

Blade mean velocity, U_m = 162 m/s

Mass flow rate, m = 10.5 kg/s

Rotational speed, N = 10500 rpm

Reaction ratio, R = 50 %

Work done factor, λ = 0.92

Inlet stagnation temperature, T_{01} = 288°K

Inlet stagnation pressure, P_{01} = 1 bar

Stagnation temperature rise, ΔT_{0s} = 15°K

Stage efficiency, η_s = 84 %

Polytropic efficiency, η_p = 87 %

Blade aspect ratio, AR = 3

Pitch-chord ratio, s/c = 0.5

Assume properties of air, $\gamma = 1.4$, $C_p = 1005$ kJ/kg°K, $MW = 28.96$, $R = 287$ J/kg°K

(i) Determination of the Blade Mean Diameter, $U_m = \frac{\pi \times D_m \times N}{60}$

(ii) Calculation of Stagnation Pressure Ratio, $R_s = \left[1 + \frac{\eta_s \times \Delta T_{0s}}{T_{01}} \right]^{\frac{\gamma}{\gamma-1}}$

(iii) Calculation of the Air and Blade Angles for Rotor, $\lambda = \frac{C_a}{2U} (\tan \beta_1 + \tan \beta_2)$

(iv) Calculation of the Rotor Inlet Properties,

Absolute Velocity, $\cos \alpha_1 = \frac{C_a}{C_1}$, Whirl Velocity, $\sin \alpha_1 = \frac{C_{w1}}{C_1}$ Relative Velocity, $\cos \beta_1 = \frac{C_a}{v_1}$

(v) Calculation for First Stage

Number of blades, blade hub and blade tip diameters for first stage can be calculated by $T_{02} = T_{01} + \Delta T_{0s}$.

Outlet stagnation pressure can be calculated from stagnation pressure ratio equation, $R_s = \frac{P_{02}}{P_{01}}$

Outlet static temperature, $T_2 = T_{02} - \frac{C_2^2}{2C_p}$

Outlet static pressure, $\frac{P_2}{P_{02}} = \left[\frac{T_2}{T_{02}} \right]^{\frac{\gamma}{\gamma-1}}$

Inlet static temperature, $T_1 = T_{01} - \frac{C_1^2}{2C_p}$

Inlet static pressure, $\frac{P_1}{P_{01}} = \left[\frac{T_1}{T_{01}} \right]^{\frac{\gamma}{\gamma-1}}$

Air Density, $\rho_1 = \frac{P_1}{RT_1}$

mass, $m = \rho_1 \times A_1 \times C_a$

Blade Height, $A_1 = \pi \times D_m \times h_1$

Number of Blades, $z = \frac{\pi \times D_m}{s}$

Tip and Hub Diameter, $D_t = D_m + h_1$, $D_h = D_m - h_1$

(vi) Calculation for Second, Third, Fourth and Fifth Stage

Outlet stagnation temperature and pressure at the previous stage is inlet stagnation temperature and pressure for the next stage. So, stagnation temperature, stagnation pressure, static temperature, static pressure, air density, flow area, blade height, blade chord, blade thickness, blade pitch, number of blades, blade hub and blade tip diameters for the remaining stages of compressor rotor can be described by the following result table.

Table. Result Table of Five-Stage Axial Flow Compressor

Stage	1	2	3	4	5
T ₀₁ (°K)	288	303	318	333	348
P ₀₁ (bar)	1	1.162	1.569	2.462	4.489
R _s	1.162	1.35	1.569	1.823	2.118
T ₀₂ (°K)	303	318	333	348	363
P ₀₂ (bar)	1.162	1.569	2.462	4.489	9.507
T ₁ (°K)	276.05	291.05	306.05	321.05	336.05
P ₁ (bar)	0.862	1.009	1.372	2.166	3.972
T ₂ (°K)	282.91	297.91	312.91	327.91	342.91
P ₂ (bar)	0.914	1.248	1.98	3.645	7.789
ρ ₁ (kg/m ³)	1.088	1.208	1.562	2.351	4.118
A ₁ (m ²)	0.063	0.0571	0.044	0.0294	0.0167
h ₁ (m)	0.068	0.062	0.048	0.032	0.018
c ₁ (m)	0.022	0.021	0.016	0.0105	0.006
t ₁ (m)	0.00022	0.00021	0.00016	0.00011	0.00006
s ₁ (m)	0.011	0.0102	0.008	0.0052	0.003
n (blades)	82	90	117	175	307
D _t (m)	0.363	0.357	0.343	0.327	0.313
D _h (m)	0.227	0.233	0.247	0.263	0.277

B. Calculation of Power of Axial Flow Compressor

(i) To calculate the compressor power,

the work done of compressor, $W = C_p \times \Delta T_{\text{overall}} = C_p \times (T_{02} - T_{01}) = 75.375 \text{ kJ/kg}$

Compressor power, $\text{Power} = m \times W = 10.5 \text{ kg/s} \times 75.375 \text{ kJ/kg} = 1060 \text{ hp}$

(ii) Calculation of Polytropic Head

Assume $Z = 1$, $MW = 28.96$

Specific gas constant is $R = \frac{8314}{MW} = 287 \text{ J/kg}^\circ\text{K}$

(iii) Static temperature at compressor outlet can be calculated by $T_2 = 363 - \frac{200.95^2}{2 \times 1005} = 342.9^\circ\text{K}$

(iv) Outlet static pressure can be calculated from $\frac{P_2}{P_{02}} = \left[\frac{T_2}{T_{02}} \right]^{\frac{\gamma}{\gamma-1}} = 7.789 \text{ bar}$

(v) Pressure ratio across the compressor is $r_p = \frac{P_2}{P_1} = 9.036$

(vi) Polytropic head can be calculated by $H_p = Z \times R \times T_1 \times \frac{n}{n-1} \left[(r_p)^{\frac{n-1}{n}} - 1 \right] = 255.649 \text{ kNm/kg}$

C. Calculation of Inlet and Outlet Mach number

(i) Inlet Mach number is calculated by $M_1 = \frac{V_1}{\sqrt{\gamma \times R \times T_1}} = 0.6$

(ii) Outlet Mach number is calculated by $M_2 = \frac{C_2}{\sqrt{\gamma \times R \times T_2}} = 0.54$

(iii) Calculation of Inlet and Outlet Flow

Inlet flow, $Q_1 = \frac{m \times Z \times R \times T_1}{P_1} = 9.65 \text{ m}^3/\text{s} = \frac{9.65 \text{ m}^3}{(1 \text{ m})^3} \times \frac{(3.281 \text{ ft})^3}{(1 \text{ m})^3} \times \frac{60 \text{ s}}{1 \text{ min}} = 20451 \text{ CFM}$

Outlet flow, $Q_2 = \frac{m \times Z \times R \times T_2}{P_2} = 1.326 \text{ m}^3/\text{s} = \frac{1.326 \text{ m}^3}{(1 \text{ m})^3} \times \frac{(3.281 \text{ ft})^3}{(1 \text{ m})^3} \times \frac{60 \text{ s}}{1 \text{ min}} = 2811.427 \text{ CFM}$

D. Efficiency of Axial Flow Compressor

To calculate the efficiency of compressor, ideal stagnation temperature at compressor outlet can be determined by using following

equation, $\frac{T_{02}'}{T_{01}'} = \left[\frac{P_{02}}{P_{01}} \right]^{\frac{\gamma-1}{\gamma}}$

$T_{02}' = [2.118]^{\frac{1.4-1}{1.4}} \times 288 = 356.873^\circ\text{K}$

Efficiency of compressor, $\eta_c = \frac{T_{02}' - T_{01}}{T_{02} - T_{01}} = \frac{356.873 - 288}{363 - 288} \times 100\% = 91.83\%$

E. Classification of Compressor Types

Compressors can be classified based on the inlet flow and pressure ratio across the compressor.

Type of compressor is multi-stage axial flow compressor from the value of pressure ratio and inlet flow. Thus, the design of axial flow compressor is satisfied.

F. Performance Curves for Axial Flow Compressor

Performance curve is important for the design of compressor and this performance curve can be checked whether this design is satisfied or not satisfied. Figure .1 shows the performance curve of axial flow compressor based on the inlet flow rate, Q and pressure ratio and Figure .2 provides the performance curve using the value of inlet flow rate, Q and head. The design performance curves are nearly similar to the original performance curve of axial flow compressor. So, the design calculations of axial flow compressor are satisfied.

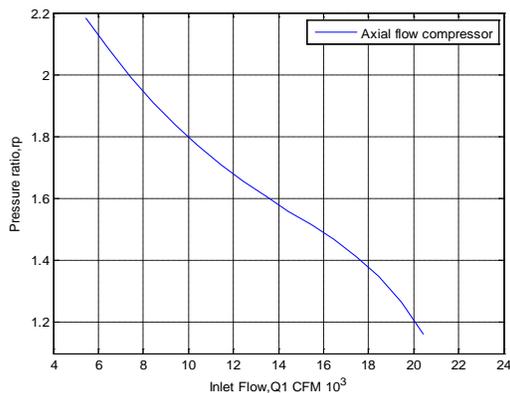


Figure.1. Performance Curve for Axial Flow Compressor; r_p and Q_1

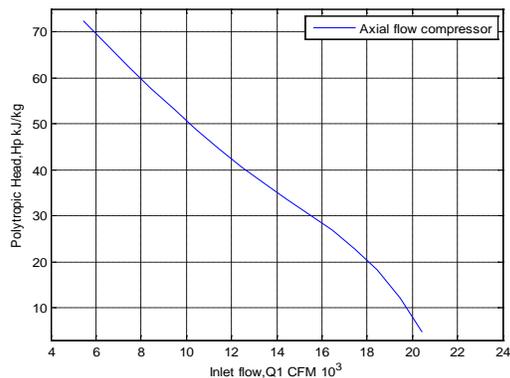


Figure.2. Performance Curve for Axial Flow Compressor; H_p and Q_1

III. CONCLUSION

This paper is attempted to design multi-stage axial flow compressor for gas turbine engine. The design of compressor calculated in this paper is blade mean diameter of 0.295 m for all five stages. Number of blades for the first stage rotor is 82 blades, the second stage rotor is 90 blades, the third stage rotor is 117 blades, the fourth stage rotor is 175 blades and 307 blades for the fifth stage rotor. Material selection for the rotor blade is steel. Rotor air inlet angle α_1 is 11.3° and rotor air outlet α_2 is 40.85° . Rotor blade inlet angle β_1 is equal to rotor air outlet angle α_2 and rotor blade outlet angle β_2 is equal to rotor air inlet angle α_1 since the reaction ratio for this compressor is 50%. Inlet absolute velocity, C_1 is 155 m/s, inlet whirl velocity, C_{w1} is 30.37 m/s and inlet relative velocity, V_1 is 200.95 m/s. Inlet relative Mach number, M_1 is 0.6. Outlet absolute velocity, C_2 is 200.95 m/s, outlet whirl velocity, C_{w2} is 131.43 m/s and outlet relative velocity, V_2 is 155 m/s. Outlet Mach number, M_2 is 0.54. Inlet and outlet flow is 20451 CFM and 2811.427 CFM. Polytropic head is 255.649 kNm/kg. Compressor horsepower is 1060 hp and the efficiency of compressor is 91.83%.

APPENDIX

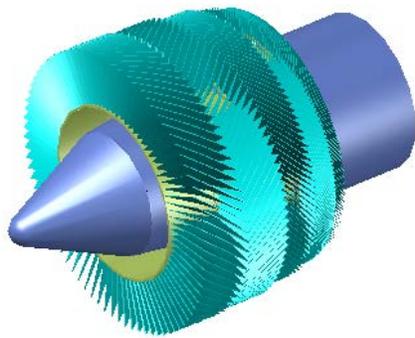


Figure A.1. Section View of Axial Flow Compressor Rotor

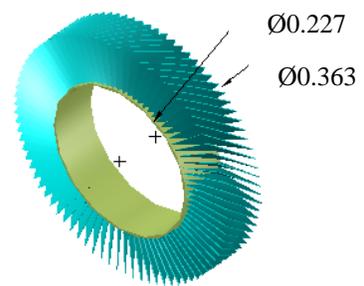


Figure A.2. Section View of First Stage Rotor

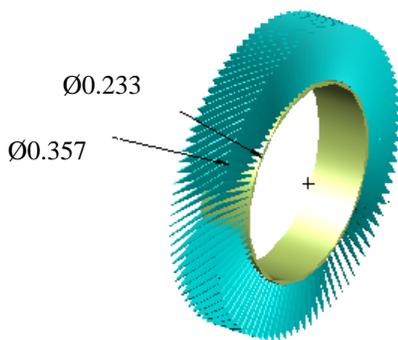


Figure A.3. Section View of Second Stage Rotor

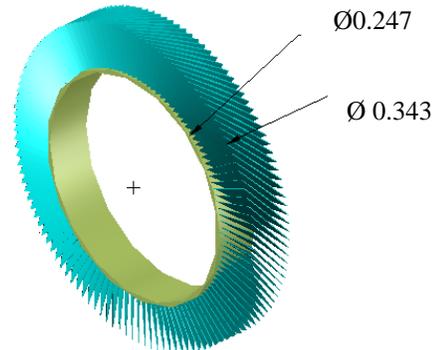


Figure A.4. Section View of Third Stage Rotor

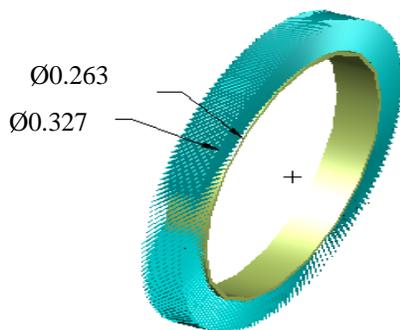


Figure A.5. View of Fourth Stage Rotor

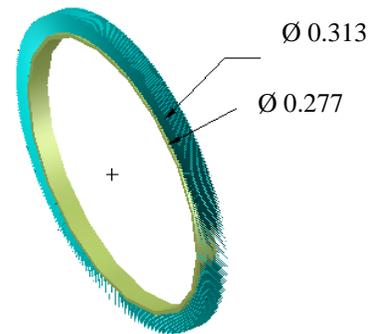


Figure A.6. View of Fifth Stage Rotor

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AUTHOR

Author – Khema Theint, Lecturer, Technological University (Kyaukse) and khematheint@gmail.com.

Effective Eradication of Plaque Formation by Using *Psidium Guajava*

Harish Kumar. M, Thamizharasan. K, Snega Priya. P, Ashwitha. A, Sankari. D*

*Corresponding author: sankariist2018@gmail.com
Department of Biotechnology, FSH, SRM Institute of Science and Technology

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ABSTRACT

The objective of the study was to reduce the dental plaque formation by the inhibitory effect of the extracts taken from *Psidium guajava* and eggshell against the pathogens present in the plaque. 10 plaque samples were collected and bacterial colony was isolated by using different media (Blood agar media, Nutrient media, and nutrient broth). The *Streptococcus mutans* have been the major dental plaque pathogen confirmed by 16srRNA sequencing. The inhibition of the *Streptococcus mutans* (HS SRM) by *Psidium guajava* and egg shell is proved by antibacterial activity test by antibiotic sensitivity test. Further, GC-MS determined the components of *P.guajava* which contains Tetrakis (2, 3-Ditert-Butylphenyl), 2, 6, 10, 14, 18, 22-Tetracosahexane, 1, 2-Benzendicarboxylic acid. Egg shell contains Oleic acid, Propyl ester, Squalene, 1, 2- Benzendicarboxylic acid, Pentadecanol. From this current research it has been proven that the *Psidium guajava* and egg shell is the effective curative agent against dental plaque by inhibiting *Streptococcus mutans*.

Index Terms: Plaque, *Psidium guajava*, egg shell, *Streptococcus mutans*, GC-MS, 16srRNA sequencing

I. INTRODUCTION

Dental plaque is a sticky colorless biomass of bacteria that grows on the surfaces of teeth leading to the formation of tartar or demineralization of teeth which is often pale yellow or brown (Darby M L *et.al*, 2010; James B. Summitt *et.al*). *Streptococcus mutans* and some other anaerobes invades the tooth surface which plays a major role in the formation of biofilm. (Kolenbrander P. *et.al*, 2010; Chaminda Jayampath Seneviratne *et.al*, 2014).

Facultative anaerobes like *Streptococcus mutans* are major contributor of tooth decay which are commonly found in human oral cavity (A.L. Coykendall *et.al*, 1974; Carlsson J. *et.al*, 1973). The demineralization of tooth is caused by cariogenic microorganism *S.mutans* by breaking down of sugar producing an acidic environment. (Howard K. Kuramitsu *et.al*, 1993). Water insoluble glycans, acid tolerance and production of lactic acid are the three main virulence factors found in *S.mutans*.

Huge amount of calcium and mineral content found in eggshell proves it to be an ideal treatment for healing cavities. Egg shell were found to lower the acidic content of teeth and to prevent white spot tooth disease. The

eggshells are widely used in restoring the mineral and calcium of teeth (Gaurav Balu Dafal *et.al*, 2017). *Psidium guajava* contains medicinally important phyto constituents that widely used in food technology and pharmacology. *P.guajava* is widely known for its antimicrobial, antigenotoxic, anti-inflammatory, antidiabetic. Hence, it can be preferred for treating diarrhoea, dental plaque, diabetes (Rosa Martha Perez Gutierrez *et.al*, 2008)

II. MATERIALS AND METHODS

Collection of sample:

Five to ten plaque sample were collected from SRM Hospital and Dental College. The samples were stored in the sterile tubes containing normal saline at 4°C in the laboratory condition.

Isolation and screening of plaque sample:

Plaque samples were screened using various media with optimum conditions. The plaque samples were inoculated in 3 different media which include blood agar medium, Nutrient agar medium and Nutrient broth. Both Agar plates and broth test tubes were incubated at room temperature for 24 hours. After incubation single colonies were selected, subcultured and used for further studies and their biochemical and physiological characteristics has been evaluated (Nada H.A. Al-Mudallal *et.al*, 2008; Jean A. Setterstrom *et.al*, 1979)

Antibacterial activity:

The antibacterial activity of organic solvents of *Psidium guajava* and egg shell against bacterial colony isolated from plaque sample were determined by agar diffusion method where the pathogens are swabbed on Muller Hinton agar plates. The wells were made using gel puncture. The samples egg shell and psidium guajava, 10µl of Ampicillin (+Ve control), 10µl of petroleum ether (-Ve control) were added to the respective wells and incubated overnight at 37°C. After 24hrs of incubation the zone of inhibition was calculated. Finally the sample which showed higher zone of inhibition was identified by 16s rRNA sequencing (Nada H.A. Al-Mudallal *et.al*, 2008; Adhraa S *et.al*, 2016)

Solvent extraction by using soxhlet apparatus:

The *psidium guajava* and the egg shell was dried for 15 days in sunlight, then boiled for 8 hours to remove the unwanted substance from the eggshell. 500ml of petroleum ether was used as an organic solvent for plant extraction. The soxhlet apparatus was allowed to proceed for 3 hours and the petroleum ether was used as solvent. The *Psidium Guajava* and egg shell extract was extracted (Gerard L *et.al*, 2011).

Gas chromatography and mass spectrometry:

The extracts of *Psidium Guajava* and egg shell was then subjected to GC-MS for the determination of mixture of components.

III. RESULTS

Isolation and screening of plaque sample:

Plaque samples cultured on the blood agar plates were subcultured repeatedly several times in order to obtain pure cultures. Gram staining test confirmed presence of gram positive, catalase and voges proskauer test confirmed the

presence of *Streptococcus mutans*. Zone of incubation of samples showed the maximum activity 13mm and 22 mm against to *S.mutans*. *Psidium guajava* show the highest incubation zone compare to the egg shell (**Table 1**).

SAMPLE	ZONE OF INHIBITION (IN mm)
Egg shell	13
Sample (HSSRM)	22
Positive control	12
Negative control	0

TABLE 1: Zone of inhibition *S.mutans* stain

16S rRNA sequencing:

The screened plaque sample strain (HS SRM) was identified a molecular level by 16srRNA sequencing was confirmed *Streptococcus mutans* (NR 115733.1) and phylogenetic tree analysis using MEGA software confirmed the species as *Streptococcus mutans* (**Fig 1**)

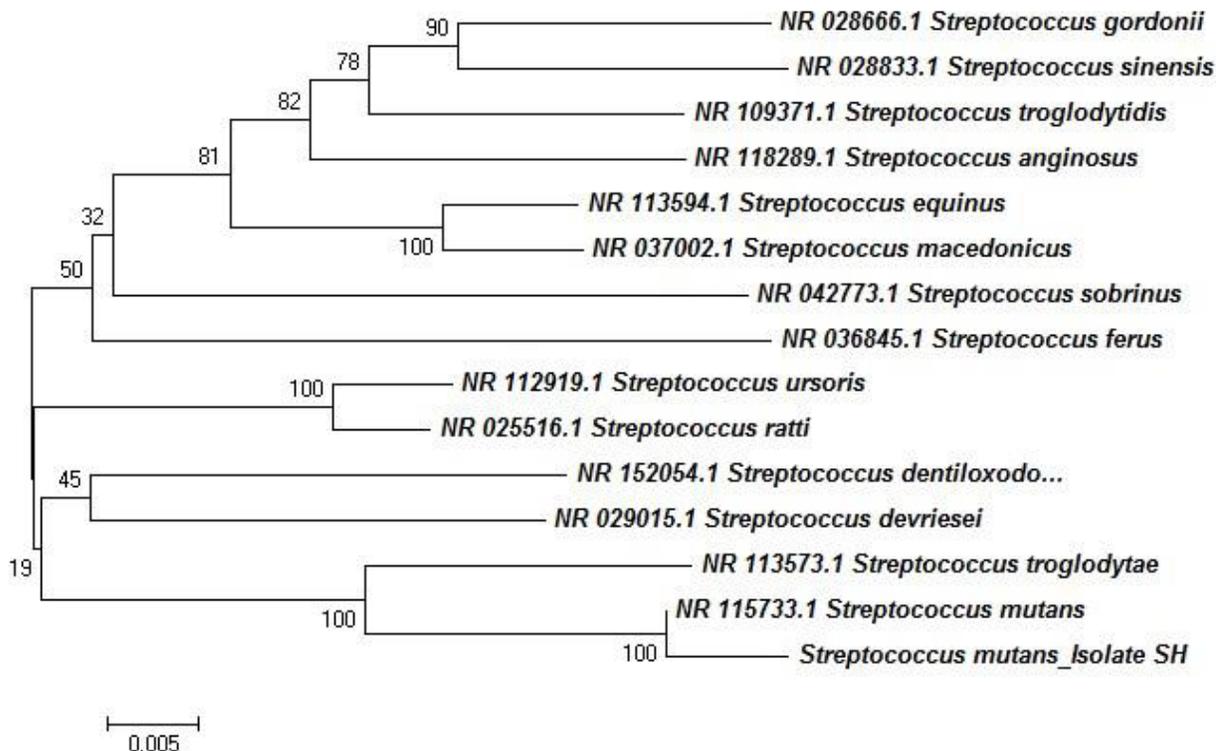


Fig 1 PHYLOGENRTIC TREE ANALYSIS OF PLAQUE SAMPLE HS SRM

Gas chromatography and mass spectrometer:

The pant extraction was done by using soxhlet apparatus. Two different kind of samples egg shell and bark of *Psidium guajava* were analysed by GC-MS technique in which the complex mixture of chemicals maybe separated, identified and quantified. Samples are usually analyzed as organic solutions, consequently materials of interest need to be solvent extracted and the extract subjected to various ‘wet chemicals’ technique before GC-MS analysis is possible. In this result show high retinal time compounds present in the bark of *Psidium Guajava* compared to the egg shell (Table 2, 3; Fig 2, 3).

Table 2: GC –MS – EGG SHELL

Peak#	R.Tim	e I.Time	F.Time	Area	Area%	Height	Height%	A/H	Mark	Name
1	11.407	11.383	11.425	4227	0.12	3673	0.23	1.15	MI	N-ALLYLOXYMETHYLACRYLAMI
2	11.505	11.492	11.517	1212	0.03	1241	0.08	0.98	MI	OXIRANE, 2,2'-[OXYBIS(METHYLE
3	12.950	12.917	12.992	28958	0.80	14933	0.94	1.94	MI	PYRIMIDINIUM, 5-CARBOXY-4-(1,1
4	13.906	13.833	14.100	1356191	37.41	403229	25.48	3.36	MI	1,2-BENZENEDICARBOXYLIC ACID
5	15.920	15.883	16.000	47954	1.32	11858	0.75	4.04	MI	Isoamyl nitrite
6	16.148	16.117	16.183	44532	1.23	29799	1.88	1.49	MI	2-DODECANOL, 1,1-DICHLORO-
7	16.218	16.200	16.258	8212	0.23	6374	0.40	1.29	MI	2-DECYLOXYETHANOL

8	16.898	16.867	16.925	18774	0.52	9311	0.59	2.02	MI	1,2-BENZENEDICARBOXYLIC ACID
9	17.392	17.375	17.417	6667	0.18	5086	0.32	1.31	MI	Acetic acid, trifluoro-, 2,2-dimethylprop
10	17.509	17.475	17.533	14850	0.41	9019	0.57	1.65	MI	DECANOIC ACID, 8-METHYL-, MET
11	17.855	17.817	17.908	71140	1.96	29026	1.83	2.45	MI	1,2-BENZENEDICARBOXYLIC ACID
12	17.960	17.925	18.000	50949	1.41	19800	1.25	2.57	MI	HEXADECANOIC ACID
13	18.183	18.158	18.217	42723	1.18	27235	1.72	1.57	MI	1-TETRADECENE
14	19.656	19.583	19.733	86746	2.39	15935	1.01	5.44	MI	.BETA.-D-RIBO-HEXOPYRANOSE,
15	20.047	19.983	20.075	34701	0.96	15338	0.97	2.26	MI	1-UNDECANOL
16	21.751	21.667	21.775	27841	0.77	8193	0.52	3.40	MI	1-PENTADECANOL
17	22.023	21.992	22.050	13359	0.37	6731	0.43	1.98	MI	3-HEXEN-1-OL, PROPANOATE, (Z)
18	22.887	22.850	22.925	102108	2.82	55517	3.51	1.84	MI	1,2-BENZENEDICARBOXYLIC ACID
19	24.958	24.917	25.008	478815	13.21	285835	18.06	1.68	MI	Squalene
20	28.762	28.708	28.808	1098871	30.31	586385	37.05	1.87	MI	Silane, dimethyl(docosyloxy)butoxy-
21	29.722	29.683	29.750	45972	1.27	19698	1.24	2.33	MI	ETHYL ISO-ALLOCHOLATE
22	29.842	29.800	29.867	40828	1.13	18314	1.16	2.23	MI	OLEIC ACID, PROPYL ESTER
	100.00	1582530	100.00							

Fig 2: EGGSHELL GC-MS

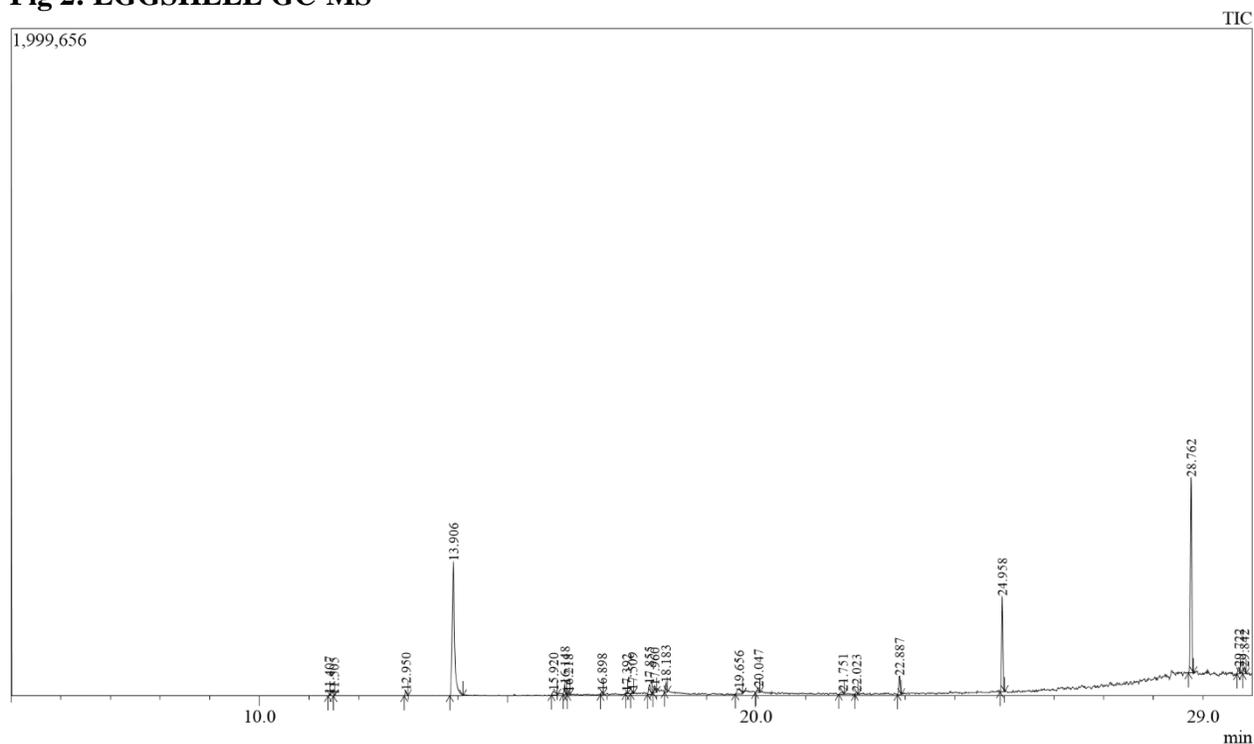
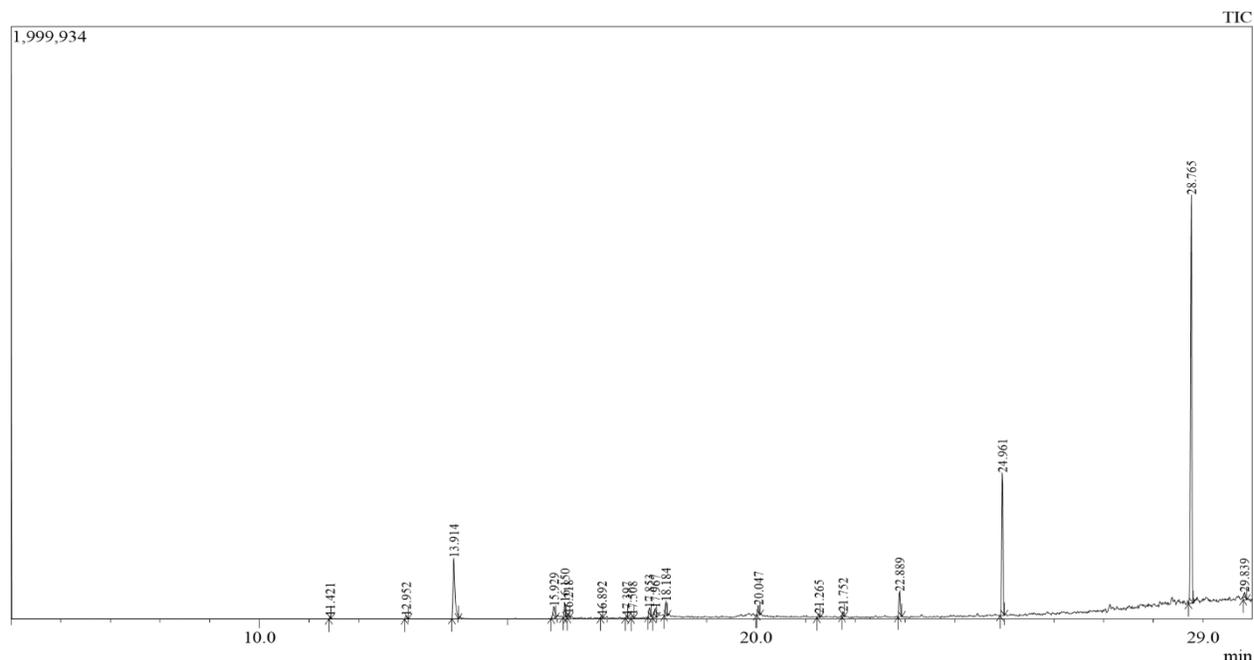


Table 3: GC-MS *PSIDIUM GUAJAVA*

Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Height%	
	A/H Mark	Name						
•	11.421	11.400	11.442	11158	0.24	8696	0.35 1.28	
	MI	1-TETRADECANOL						
•	12.952	12.925	13.000	21720	0.46	10248	0.41	
	2.12 MI	PYRIMIDINIUM, 5-CARBOXY-4-(1,1						
•	13.914	13.875	14.008	573450	12.16	204954	8.23	
	2.80 MI	1,2-BENZENEDICARBOXYLIC ACID						
•	15.929	15.875	15.967	115813	2.46	39231	1.58 2.95 MI	
	5	16.150	16.117	16.175	77643	1.65	49832	2.00 1.56 MI
	16.218	16.200	16.250	19502	0.41	12129	0.49	
	1.61 MI	2-PROPYLDECAN-1-OL						
•	16.892	16.867	16.917	13375	0.28	9035	0.36 1.48	
	MI	1,2-BENZENEDICARBOXYLIC ACID						
•	17.397	17.367	17.417	12933	0.27	7303	0.29 1.77	
	MI	2-OCTYLDODECAN-1-OL						
•	17.508	17.483	17.542	18042	0.38	10269	0.41	
	1.76 MI	TETRADECANOIC ACID, 12-METHY						
•	17.853	17.825	17.892	51140	1.08	28772	1.16	
	1.78 MI	1,2-BENZENEDICARBOXYLIC ACID						
•	17.967	17.917	18.000	85201	1.81	30865	1.24	
	2.76 MI	HEXADECANOIC ACID						
•	18.184	18.150	18.217	88435	1.87	47278	1.90	
	1.87 MI	1-TETRADECANOL						
•	20.047	20.017	20.083	56764	1.20	32283	1.30	
	1.76 MI	1-TETRADECANOL						
•	21.265	21.225	21.292	24497	0.52	12233	0.49	
	2.00 MI	2-t-Butylperoxy-2-ethylbutan-1-ol, buty						
•	21.752	21.733	21.775	24284	0.51	16705	0.67	
	1.45 MI	HEPTENAL						
•	22.889	22.858	22.933	157635	3.34	84644	3.40	
	1.86 MI	1,2-BENZENEDICARBOXYLIC ACID						
•	24.961	24.917	25.000	837354	17.75	481570	19.34	
	1.74 MI	2,6,10,14,18,22-TETRACOSAHEXAE						
•	28.765	28.708	28.800	2471969	52.41	1379752	55.40	
	1.79 MI	TETRAKIS(2,3-						
	DITERT-BUTYLPHEN	19	29.839	29.808	29.883	55725	1.18	
	MI	UNDECANENITRILE	4716640	100.00	2490531	100.00		

Fig 3: *PSIDIUM GUAJAVA* GC-MS



IV. DISCUSSION

Psidium guajava have long been recognized for their antibacterial activity inhibiting both gram positive and gram negative bacteria such as *S.aureus*, *S.mutans*, *Pseudomonas aeruginosa*, *Salmonella enteritis* and *Bacillus cerans*. The bark of *Psidium guajava* can be regarded as the curative agent of dental plaques against dental plaque.

The identification of *S.mutans* is based on (Essam F. A. Al-Jumaily *et.al.*) distinctive colonial morphology on selective agar, Gram staining, distinctive cell shape on light microscopy, specific growth characteristics, and sugar fermentation. In addition to that *S.mutans* isolates was identified by the commercial biochemical test the identification also was depended the test results. So the bark of *Psidium guajava* have capacity for act as an antibacterial activity for against to *S.mutans* (Pongask Rattanachaiakunsopon *et al.*, 2010; T. Suman, *et.al*, 2010)

According to previous report, *Streptococcus mutans* was confirmed as one of the important bacteria for affected the tooth and it is form a biofilm .Also many bacteria present in the given plaque sample but *Streptococcus mutans* is the major cause the tooth decay. Therefore, this study aimed at analysis for identified the bacteria which one mostly involved the biofilm formation and it is reason for tooth decay.

The analysis of GC-MS indicates the bark of *Psidium guajava* have a high antibacterial activity against *Streptococcus mutans* compared to the egg shell. Therefore, aimed to focus the chemical compound playing a major role against the plaque sample.

V. CONCLUSION

Overall result suggested that the bark of *Psidium guajava* is an antibacterial agent against the plaque sample (*Streptococcus mutans*) compared to the eggshell. This study also prove the importance of *Psidium guajava* in the dental plaque hence can be regarded as the safe curative agent for dental plaques and further can be commercialized.

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AUTHOR INFORMATION

Harish Kumar. M, B .Sc. Biotechnology, SRM Institute of Science and Technology, harishjack333@gmail.com

Thamizharasan. K, PhD Biotechnology, SRM Institute of Science and Technology, thamizhk01@gmail.com

Snega Priya. P, B.Sc. Biotechnology, SRM Institute of Science and Technology, snegapriya1997@gmail.com

Ashwitha. A, M.Sc. Biotechnology, SRM Institute of Science and Technology, sriashwitha@gmail.com

Corresponding author: Sankari. D

sankariist2018@gmail.com

Department of Biotechnology, FSH, SRM Institute of Science and Technology

Knowledge About Antiparasitic Medicinal Herbs of the Students of FACISA, 2017.

Paola Gavilán¹, Gloria Ayala², Diosnel Amarilla M.³, Celina Recalde⁴, Agustina Nakayama⁵ and Juan Caballero⁶

*Faculty of Health Sciences (FACISA)

**National University of Canindeyú (UNICAN) - Paraguay

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Abstract- In Paraguay, the consumption of medicinal herbs in traditional beverages is strongly ingrained. Antiparasitic herbs are widely used as necessary for the elimination of parasites. The objective of the work was to determine the knowledge of the students of the Faculty of Health Sciences, regarding the antiparasitic medicinal herbs, period 2017. The study is descriptive, field, cross section with a single measurement. The study population N = 60 and a sample n = 54 correspond to the students of the nursing career of FACISA-UNICAN, the sample was for convenience because those present were taken at the time of data collection. The technique of collection applied was the survey of closed questions based on theory. In the results it was obtained that 86% of the sample refers that they know the antiparasitic herbs and 14% do not; 84% would be willing to use as an alternative for the ailments and 16% would not; The medicinal plants named are the ka'are (*Chenopodium ambrosioides*) with 31.37%, the suico (*Tagetes minuta*) with 24.51%, Verbena (*Verbena officinalis*) 9.8%, wormwood 4.9%, boldo (*Peumus boldus*) 2.94% and other 8.82 %; The way of use of antiparasitic plants are; in the infusion with 66.00%, syrup with 28.00% and bath with 6.00%. Based on the results it can be concluded that 86% of the students surveyed have knowledge about antiparasitic medicinal plants and 84% would be willing to use it as an alternative in the treatment, and the most frequent use is the infusion with 66.00%

Keywords: antiparasitic, medicinal herbs, parasite, plant

INTRODUCTION

The medicinal plants are those plants that elaborate secondary metabolites, called "active principles", substances that exert a pharmacological action, beneficial or harmful, on the living organism. Its primordial, sometimes specific, utility is to serve as a drug or medication that relieves diseases or reestablishes lost health ⁽¹⁾. The parasites that lodge in the human intestine, especially in children, can be of various types. The most common are tapeworms, ascarids (worms), and pinworms (small white worms). These parasites normally live attached to the intestinal walls by means of suction cups. Some, like tapeworms, can measure up to five meters and produce abdominal pain, nausea and lack of appetite; others, such as pinworms, are so small that they are barely perceptible, except that they usually produce anal itching, and phytotherapeutic treatments are based on the application of plants with vermifuge action, which eliminates, paralyzes or expels these parasites⁽²⁾. And it is always recommended to take these antiparasitic drugs on an empty stomach and at night before sleeping, whether in the form of tea, infusion, crushed as in the case of seeds or others. As they are not such strong doses, ingestion is recommended for three continuous days and then repeated after three months. In the course of that time, you will already see blushing faces, greater vitality and performance⁽³⁾.

In our country the knowledge and use of medicinal herbs is ancestral and is articulated by the history of indigenous communities because Paraguay has a varied natural wealth, in terms of its flora and fauna. The country is eminently traditional to medicinal herbs, since its culture is strongly rooted in the consumption of these in morning drinks as mate and refreshing as tereré, more infusions for various diseases according to beliefs, from these beliefs the importance of know if nursing career students know the medicinal properties of plants or herbs that are attributed to parasitic infections.

This work is important because there are antiparasitic herbs that could benefit people with limited resources who can not acquire antiparasitic drugs from laboratories because of the high cost, it can also help to maintain traditional culture in health professionals and thus enrich the cultural knowledge of society.

Formulation of the problem or hypothesis

Is it known the properties and proper use of antiparasitic medicinal plants by nursing students?

The main objective was: Determine the knowledge of students of the Faculty of Health Sciences, regarding medicinal herbs antiparasitic, period 2017.

The Specific Objectives were:

1. Determine the number of students who would be willing to use antiparasitic medicinal herbs.
2. Determine the most used antiparasitic medicinal herbs according to students of FACISA.
3. Determine the knowledge of the students regarding the methods of use of the antiparasitic plants.

METHODOLOGY

Study area: The work was carried out on the premises of the Faculty of Health Sciences of the National University of Canindeyú, located in the city of Salto del Guará, Department of Canindeyú – Paraguay.

The type and level of the research were descriptive and exploratory, because the study phenomenon was described. Whose research design was quantitative and taken to the field to collect data, it was made directly from the reality where the events occurred.

The studied population were students of the National University of Canindeyú in the Faculty of Health Sciences, undergraduate degree in Nursing that total were N = 60 of which a total of n = 54 sample of evaluated students was taken, for which the conclusions that were obtained were valid.

The techniques and instruments for data collection were applied a questionnaire of self-administered surveys with closed questions, taking into account all ethical considerations, with informed consent and the anonymity of the questionnaires.

RESULTS

According to the results obtained in the survey it was found that 86% of students say they know antiparasitic medicinal plants and 14% do not know them, as shown in table 1, and it coincides with the work done by Garzón ⁽⁴⁾, about an indigenous people that most know about medicinal plants as antiparasitic, and that in this work with a student of health they show that they have knowledge about medicinal herbs.

Table 1, Knowledge of antiparasitic medicinal plants.

Knowledge about medicinal plants	Results in percentage of the total of the respondents
If you know	86%
Do not know	14%

Source: self made -2017

According to the result shown in Table 2, 84% of the students report that they would be willing to use medicinal herbs as antiparasitic and 16% would not be using it for personal reasons, and this result demonstrates the importance of the participation of students to produce new knowledge for society ⁽⁵⁾, in health professionals, especially nurses, in studies and research involving the use of medicinal plants, acting as a facilitator in the rescue of traditional knowledge and its scientific validation.

Table 2, number of students who would be willing to use antiparasitic herbs

Would you be willing to use antiparasitic herbs?	Results in percentage of the total of the respondents
If I would use	84%
I would not use	16%

Source: self made -2017

The result on the methods to alleviate conditions is shown in Table 3, which in first place is the infusions with 66%, the second method is the syrup with 28% and less used is the bath with 6%. Also in another work done is mentioned that medicinal plants are highlighted because there is a high percentage of students who have knowledge of plants and traditional medicine, mainly through their families, where the participation of the grandmother is of great importance ⁽⁶⁾.

Table 3 shows how to alleviate some type of discomfort or illness

When do you have a bad illness or illness, what is the first way to alleviate it?	Results in percentage of the total of the respondents
Infusions	66%
Syrups	28%
Bath	6%

Source: self made -2017

In table 4, students report that the most well-known antiparasitic plant is kaáre (*Chenopodium ambrosioides*) with 31.37%; then the suico (*Tagetes minuta*) with 24.51%, the verbena (*Verbena officinalis*) with 9.80%, and those who did not know any types of antiparasitic plants also with 9.80%, the pipi rapo (*Petiveria alliacea*) with 7.84% and the other antiparasitic medicinal plants in smaller proportion, also some plants cited in the manual of medicinal herbs of Paraguay ⁽⁷⁾.

Table 4 the types of antiparasitic medicinal plants better known by the students of FACISA.

The types of antiparasitic medicinal plants that you know		
Common name	Scientific Names	Percentage
Ruda	Ruta graveolens	0,98%
Burrito	Aloysia polystachya	0,98%
Malva blanca	Sida cardifolia	0,98%
Typycha hu	Escoparia dulcis L.	0,98%
Neem	Azadirachta indica	0,98%
Menta´i	Mentha piperita	1,97%
Tarope	Azadirachta indica	1,97%
Boldo	Peumus boldus	2,94%
Ajenjo	Artemisia absinthium	4,90%
Pipi rapo	Petiveria alliacea	7,84%
No sabe	-	9,80%
Verbena	Verbena officinalis	9,80%

Suico	Tagetes minuta	24,51%
Ka`are	Chenopodium ambrosioides	31,37%

Source: self made -2017

CONCLUSION

86% of the sample states that they know the antiparasitic herbs and 14% do not; and 84% would be willing to use as an alternative for the ailments while 16% would not use it; among the medicinal plants named are the ka`are with 31.37%, the suicide with 24.51%, Verbena 9.8%, wormwood 4.9%, boldo 2.94% and other 8.82%; The use of antiparasitic plants are infusion with 66.00%, syrup with 28.00% and bath with 6.00%.

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Correspondence Author – Diosnel Amarilla, email address, lionelms@hotmail.com; alternate email address diosnel.amarilla@gmail.com, contact number. +595986408507

Climate Change Due to Human activities, and its Health impact.

¹Nisreen Husain and ²Touseef Hussain Trak.

¹Dept. of Zoology, Govt. Dr. W. W. Patankar Girls' P.G College, Durg, C.G.

²Dept. of Botany, Govt. Degree College, Kishtwar, Jammu & Kashmir, India.
touseeftrak@gmail.com

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Abstract:

Humankind and animal life as well is being constantly subjected to the impacts of rapid environmental changes in the past few decades. The accelerated changes resulting from industrialization and significant increase in global population over the last century have resulted in irreversible damage and loss of resources. The interrelated factors involved in the climatic changes through natural calamities and human interference is reflected in the form of impacts on human health. Direct effects comprise changes in stress response of humans, atmosphere pollution, water quality and availability. Indirect effects include different factors that cause various diseases and infections, especially that are spread through vectors. Precautions and specificity about the climate change impacts on health is quite complex. It is because populations have different vulnerabilities to change and susceptibility to disease. However, the coordinating efforts between the economic growth, social development, environmental protection and individual attempts, could help reduce the health impacts and implement the measures towards better management.

Keywords: *Climate, Health, Diseases.*

Introduction

The drastic variations caused in the environmental conditions affect adversely the implications and interactions of climatic factors. This is scientifically called the 'Climatic change' which is a continuous and never-ending process in today's world. The variability in weather conditions lead to the chain of fluctuations in earth temperatures, melting points, and sea levels. The changes resulting due to the rise and fall of the climatic parameters interfere with human health showing adverse impacts. Though the health responses for many of such impacts is well known by the people, but the unpredictable climate changes increase the complexity.

The changing climatic condition and human health are always correlated. Different conditions of the climate create different problems in human population like, hyperthermia is caused by heat and hypothermia by cold, and droughts cause famine. Diseases and death results from floods, hurricanes, tornadoes, and forest fires. The risk and spread of vector-borne diseases in living organisms, such as malaria, Rift valley fever, plague, and dengue fever is affected by the change in climate. Risk of food borne, air borne and water-borne diseases are also increased by weather resulting in emerging infectious diseases caused by Hantavirus, Ebola virus, and West Nile virus. Thus, climate change show direct effect on human health, alongwith the decreased status of social determinants of health, and alarming threats to the environmental compatibility provided by nature and its sources. (Reiter *et al.*, 2004; Semenza, 2009).

The multiple harmful effects due to climate change interact with the already existing vulnerabilities, thereby causing worse health impacts. Most important fact is that almost all of the health status is affected by the intense health systems, and its capability manage and cope with the health hazards, exclusively sensitive due to climate change. The climate-affected health risks occur due to the gradual alterations in the normal environmental conditions, but the variability is also influenced, such as heat waves, storms, and floods. These are far less predictable than the normal or average set of conditions, but have the capacity to hinder the health facilities, affect social systems, and disturb the key infrastructure. Their irreversible consequences are more harmful, for example the storm surges flood, that in turn influences both the inhabited areas and natural ecosystems.

Climate change as Health threat to Humans.

The fact change in the climate, has significantly turned into an alarming threat to human health. Many of the human activities itself is responsible for the ill-impact on their health. The green house gases, carbon dioxide and methane affects the global climate intensely. The variation in temperature and irregularities in rainfall, which is heavy in some areas and less in others, have upset the climate status globally. Frequency in snowfall and the rise in sea level, worsen the weather mechanisms, with severe impact on environment and on human life. The world’s major climate trends and environmental factors are deteriorating due to this climate change.

Direct and Indirect effects of Climatic change on Human health

Climatic change is the global problem that has both local and regional impact that profoundly affects the people and their health. The relatively direct effects may cause injury, illness or even death, examples being the harsh heat waves or cruel hurricanes (Kalkstein, 1996). The less direct effects of the climate change involve the health impacts through the alteration in the surrounding environment. This cause physiological and reproductive disorders in the form of harmful diseases. For example, the lifecycle of insects and vectors is affected by the temperature and rainfall variations, and hence the transmission of diseases is also influenced. Thus, the climatic fluctuations, directly or indirectly, not only exhibit impacts on human health, but also influence the social and economic systems. (Table CC 1).

Table CC 1: Direct and Indirect effects on Human Health and Economic Systems

1	Direct effect on human health	Involves adverse effects on human physiology (influence of heat waves or intense hurricanes), and physical traumas (caused by natural disasters, such as, storms and floods).
2	Indirect effects on human health	Includes the effects on the production of crops, on the quality of the water, the atmosphere, and the ecology of vectors of the infectious diseases.
3	Effects on social welfare, and economic systems	Includes the effects of, for instance, prolonged drought or heavy floods, that cause migration of population, that lead to burden for resources affecting economic systems and also the social safety mechanisms.

Climate changes due to Human activities

Climatic changes are not only influenced by the natural calamities, but also the human activities that affects more adversely. In urban areas, the urban heat island and urban warming are caused by the human activities. Mostly the changes in land use is brought about through activities such as deforestation, construction of buildings and malls, the storage and excessive use of water, as well as consumption of fuel and energy. The heat stored up from the sun by the buildings and streets during the day and thereafter released slowly at night, makes the night-periods warmer than in neighboring rural regions. Heat is also generated from the other sources such as tube-lights, air-conditioners, appliances and furnaces. The buildings and roads are so constructed that the rainfall quickly runs off, curtailing the moisture requirement of the land. As in the open fields, the retention of water and moisture, on the contrary, cools down the atmosphere. In some places, a reverse of urban warming occurs, and the sub-urban cooling effects occur when the lawns and golf courses are excessively watered. Thus the changes caused in the properties of the land use give rise to different climatic changes. The climatic changes are brought about by the human activities, by causing changes in Earth's atmosphere in the amount of Greenhouse gases, aerosols and cloudiness. The pollution is also caused from the burning of fuels and from industries, that contaminate the atmosphere by releasing carbon-di-oxide into it. Beside Carbon dioxide, Methane, Nitrous oxide and the Halocarbons are also released as a result of human activities, that accumulate in the atmosphere resulting in Greenhouse effects and Global warming (Bateson and Schwart, 2004; Michael Mc *et al.*, 2006).

Discussion and Conclusion

Climate change in routinary way, according to the cyclic weather change is quite normal. It ought to be so, in order to keep the ecosystems balanced and also for sustenance of living creatures. However, the forced climate change, due to the human activities for their own selfish purposes, harms the normal physiological processes of animals and human beings themselves, causing overall disruption. Changes in climate, particularly the weather extremes, interfere with the environmental and ecosystem equilibrium, which is responsible in providing us with the basic essentialities of life, i.e., pollution-free air and water, food, shelter and security. All these factors show up adversely on human health. Also the stress sources, either natural or human-made, alongwith the climate change threaten human health and fitness, thereby risking their life.

The rapid industrialization and urbanization are consistently increasing the changes in climate, and so are its impacts on human health. The shooting pollution in the atmosphere and its resultant toxicity is the root cause of respiratory disorders, skin infections and cancers. The contaminated water and the temperature fluctuation give rise to many microbes and vectors. These, then become the significant cause of many pathogenic conditions, that lead to the development of dreadful diseases. The psychological problems also arise in the consequent chain.

Connecting our understanding about how our activities are changing the climate and how these changes are causing ill-impact on our health and survival, is the basic attempt to be followed for the welfare of humans and society. In a nutshell, the climate changes causes severe harm to the environment, health and biodiversities. Studies and research in this direction should emphasize on the serious actions to prevent the climate change. Otherwise, the life supporting planet, the Earth, will get worsen, and lead to chronic ailments and violence in the future generation.

So, the actions and the activities of human beings should be in attempt of protecting the environment and life-support system. The continued stability and proper functioning of the biosphere's ecological and physical systems, is undoubtedly responsible for the long-term good health status of populations. (Kovats *et al.*, 2005; Kalkstein, 1991)

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Level of Work Motivation: Its Relationship to Job Performance of Non-academic Staff at CapSU System

Freden S. Delgado, Felyn Mae G. Yap, Rosemarie L. Luces

Capiz State University, Poblacion Mambusao Campus, Mambusao, Capiz

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Abstract- The study was conducted at Capiz State University during academic year 2017-2018. The primary objectives of this study was to determine the level of work motivation and its relationship to job performance of non-academic staff of Capiz State University. Data were analyzed using both descriptive statistics and inferential statistics. Results were interpreted at 5 percent alpha level of significance. As to the personal characteristics of the respondents, a bigger percentage of the respondents were females, 30-40 years old, married, bachelor's degree holders, non-permanent, have been serving CapSU for 10 years and below, and earning Php10,000.00 and below. Generally, the non-academic staff of CapSU have "high" level of work motivation. Overall, the non-academic staff of CapSU have "very good" performance in their job. There is significant relationship between level of work motivation and job performance ($r=0.548$, $p=0.000$).

Index Terms- work motivation, job performance, Capiz State University

I. INTRODUCTION

It is widely recognized in the human resource literature that promotion of the motivation of workers in both private and public organizations leads to a higher quality of human resources and optimum performance.

In the Philippines, universities have the primary goals and objectives of improving and impacting knowledge through instruction, community services and research. However these objectives cannot only be achieved by the academic staff because non-academic staff of a university carries out the administrative work which will positively contribute to the afore-mention objectives. To effectively achieve these objectives, competent, motivated and qualified non-academic staffs are harnessed. Nevertheless, the performance of non-academic staff is not only a function of qualification and competence but also of motivation.

Halepota (2005) defined motivation as a person's active participation and commitment to achieve the prescribed results. Highly motivated employee would trigger the total commitment of an employee and good job performance by an employee. In the same manner, Manzoor (2012) defined motivation as a procedure that initiates through a physiological or psychological want that stimulates a performance that is intended at an objective.

Drake et al. (2007) stated that highly motivated employees are critical factor in the long term success of many organizations. Ngu (1998) also indicated that the two most variables that explain employees performance are motivation and ability. In line with this, Bernabe (2017) studied about work ethics of CapSU Mambusao Satellite College employees and found out that most of the employees have a high level of work ethics when classified as to age, gender, civil status, length of service and monthly salary. There is no significant difference in level of work ethics when employees are categorized as to age, gender, civil status, monthly salary and length of service.

Similarly, Hassan, Mehact and Danet (2011) indicated that human asset is one of the most reliable sources of organizational performance, efficiency and effectiveness. Getting employees to do their best work even in strenuous circumstances is one of the employees most stable and greasy challenges and this can be made possible through motivating them (Manzoor, 2012).

Recognition is the identification or acknowledgement given for something. According to Harrison (2005), "employee recognition is a timely, informal and or formal acknowledgement of a person's behavior, effort or business result that supports the organization's goals and values, and which clearly has been beyond normal expectations". Indeed employee recognition is now globally more relevant and embraced in any organization that is determined to succeed in an economically competitive era. Chikungwa and Chamisa (2013) stated that recognition of performance systems are powerful means of directing attention within and organization hence management must understand the psychology of praising employees for good work, to apply the principles of employee recognition and to encourage others to initiate it in their working relationships (Md et al., 2013). Employee recognition plays a key role in enhancing relationships which are meant to improve performance in an organization (Atambo et al, 2012). They also indicated that effective employee recognition leads to increased productivity as a resultant of enhanced satisfaction as seen in their commitment and devotion.

Onu, Akinlaba and Fakanmoju (2013) stated that the university management could achieve effective job performance by the non-academic staff through employee motivation packages. Non-academic staff performance fundamentally depend on many factors like performance appraisals, staff motivation, compensation, staff satisfaction, training and development, organizational structure and job security. Moreover reward is another factor that enhanced commitment and influenced worker's job performance. Rewards which are part of

motivation can either be intrinsic or extrinsic. Intrinsic rewards (motivations) are derived from within the individual. Intrinsic rewards are those rewards that can be called psychological motivations and examples are individual achievement of goal, recognition, receiving appreciation. Ajila(1997) stated that an intrinsically rewarded person will be committed to his work to the extent of which the job inherently contains tasks that are rewarding to him and will be committed to the extent that he or she can gain external rewards for his or her job performance.

Effective job performance by the non-academic staff of universities can be achieved through good remuneration (pay) which will increase their employees' performance and thereby increase the organization productivity and delivering of service Maimona (2011).

Empowerment triggers the motivational spirit of an employee. As stated by Conger and Kanungo (1988) who indicated that empowerment is a motivational concept and define empowerment at an employee as the improvement of employees self-competence. Vogt and Murrell (1990) defined empowerment as the period of improving the decision making ability of the employees through training, education, sharing and team work. Hasan et al. (2011) also pointed out that the purpose of the employee empowerment is to strengthen the achievement motives of the employees and therefore increase their contextual by an employee which result to high job performance by an employee.

Theories have been elaborated on motivational measures, and their usefulness to increase motivation and resultantly improve workers performance. Human resource management literature has emphasized on human resource performance management approaches to improve performance. The assumption is that in the presence of appropriate motivational measures and good performance management approaches workers performance will increase considerably and consequently the entire organization performance. Thus this study is being conducted. Generally, this study aimed to determine the level of work motivation and its relationship to job performance of non-academic staff of Capiz State University. Specifically, this study was pursued to answer the following questions 1. what is the socio-demographic profile of the respondents in terms of sex, age, marital status, highest educational attainment, status of employment, length of service, and basic salary? 2. What is the level of work motivation of the respondents as an entire group and when classified according to socio-demographic characteristics? 3. What is the job performance of the respondents as an entire group and when classified according to socio-demographic characteristics? 4. Do respondents' socio-demographic characteristics influence their level of work motivation and job performance? and 5. Is there a

significant relationship between level of work motivation and job performance?

II. RESEARCH ELABORATIONS

This study utilized descriptive-correlation research. The use of this research design was considered appropriate given the view of the nature of this research which aimed to determine the level of motivation and job performance and likewise to ascertain the relationship among the variables.

This study was conducted at the nine (9) campuses and satellite colleges of Capiz State University. These are Roxas Main Campus, Pontevedra Campus, Burias Campus, Dayao Satellite College, Pilar Satellite College, Tapaz Satellite College, Dumarao Satellite College, Sigma Satellite College and Mambusao Satellite College.

The respondents of the study were 195 randomly selected non-academic staff from the different offices/departments of the said campuses/colleges.

A survey-questionnaire consisting three parts was the main instrument of the study. Part I obtained information on respondents' sex, age, marital status, highest educational attainment, status of employment, length of service and basic salary. Part II determined the level of motivation adopted from Gagne, M. et al. (2010) and Part III was the job performance scale adopted from Goodman and Svyantek (1999).

The data gathered were subjected to statistical analyses using the Statistical Package for Social Sciences (SPSS) software. Descriptive statistical tools used were frequency count, percentage, mean, and standard deviation. For the inferential analysis, Pearson's r, t-test and Analysis of Variance were utilized. Level of significance was set at 0.10 alpha level.

III. RESULTS OR FINDINGS

Profile of the Respondents

VARIABLES	FREQUENCY	PERCENTAGE
Sex		
Male	60	30.8
Female	135	69.2
TOTAL	195	100.0
Age		
20-30 years old	82	42.0
31-40 years old	56	28.7
41-49 years old	28	14.4
50 years old and above	29	14.9
TOTAL MEAN = 36 years old	195	100.0
Marital Status		
Single	72	36.9
Married	113	58.0
Widow/er	8	4.1
Separated	2	1.0
TOTAL	195	100.0
Highest Educational Attainment		
Undergraduate	33	16.9
Bachelor's degree	143	73.3
Master's degree	19	9.7
TOTAL	195	99.9
Status of Appointment		
Permanent	81	41.5
Non-permanent	114	58.5
TOTAL	195	100.0
Length of Service		
10 years and below	121	62.1
11-20 years	47	24.1
21 years and above	27	13.8
TOTAL	195	100.0
Basic Salary		
10,000 and below	121	62.1
10,001-20,000	42	21.5
20,0001 and above	32	16.4
TOTAL	195	100.0
MEAN = Php13,030.11		

More than two-thirds or 69.2 percent of the respondents were females and the rest (30.8%) were males. This indicates that the non-academic staff of CapSU are dominated by females.

Majority (42.0%) were 20-30 years old; 28.7 percent, 31-40 years old; 14.9 percent, 50 years old and above; and 14.4 percent, 41-49 years old. On the average, non-academic personnel included in the study were 36 years old. It can be inferred that most non-academic staff of CapSU can still be considered young.

Majority (58.0%) of the respondents were married; more than one-third or 36.9 percent were single; the smallest portion were widow/er (4.1%) and separated (1.0%). This implies that non-academic staff of CapSU have their own family.

Almost three-fourths (73.3%) of the respondents have finished bachelor's degree; 16.9 percent, undergraduate; and 9.7 percent, master's degree. This implies that majority of the non-academic staff of CapSU have finished college.

More than half (58.5%) of the respondents were non-permanent and only 41.5 percent were permanent. This only shows that majority of the non-academic staff of CapSU do not have Plantilla position and do not have security of tenure.

Majority (62.1%) of the respondents have been in the service for 10 years and below; less than one-fourth (24.1%), 11-20 years; and 13.8 percent, 20 years and above. This indicates that majority of the non-academic staff of CapSU have been serving the University not for such a long time.

Majority (62.1%) of the respondents were receiving Php10,000.00 and below every month; 21.5 percent, Php10,001.00 to Php20,000.00; and only 16.4 percent were receiving Php20,001.00 and above. On the average, they were receiving Php13,030.11. This amount is just enough for a single individual but not for the entire family. This result can be attributed to the fact that majority of the non-academic staff are non-permanent.

Level of Work Motivation

Level of MOTIVATION	Frequency	Percentage
Very High (4.20-5.00)	98	50.3
High(3.40-4.19)	80	41.0
Average (2.60-3.39)	16	8.2
Low (1.80-2.59)	1	0.5
TOTAL	195	100.0
MEAN = 4.15 (High)	SD = 0.55	

A little over one-half (50.3%) of the respondents had “very high” level of motivation. A little over two-fifths (41.0%) had “high;” 8.2 percent, “average;” and 0.5 percent, “low.”

Generally, the respondents had “high” level of motivation. This implies that non-academic staff of CapSU are considerably motivated in their work. Motivation among employees is important in an organization.

Level of Work Motivation of the Respondents when Grouped According to Variables

VARIABLES	MEAN	VERBAL INTERPRETATION	SD
Sex			
Male	4.10	High	0.57
Female	4.18	High	0.54
Age			
20-30 years old	4.05	High	0.56
31-40 years old	4.25	Very high	0.43
41-49 years old	4.09	High	0.69
50 years old and above	4.29	Very high	0.54
Marital Status			
Single	4.14	High	0.60
Married	4.13	High	0.52
Widow/er/Separated	4.40	Very high	0.56
Highest Educational Attainment			
Undergraduate	3.98	High	0.54
Bachelor's degree	4.17	High	0.53
Master's degree	4.27	Very high	0.70
Status of Employment			
Permanent	4.20	Very high	0.56
Non-permanent	4.12	High	0.54
Length of Service			
10 years and below	4.08	High	0.58
11-20 years	4.21	Very high	0.46
21 years and above	4.36	Very high	0.51
Basic Salary			
10,000 and below	4.11	High	0.54
10,001-20,000	4.10	High	0.49
20,001 and above	4.38	Very high	0.63

Very High (4.20-5.00)

High (3.40-4.19)

Average (2.60-3.39)

Low (1.80-2.59)

Both female ($\bar{x}=4.18$) and male ($\bar{x}=4.10$) respondents had “high” level of work motivation. Respondents who were 50 years old and above ($\bar{x}=4.29$) and And 31-40 years old ($\bar{x}=4.25$) had “very high” level of work motivation while those who were 41-49 years old ($\bar{x}=4.09$) and 20-30 years old ($\bar{x}=4.05$) had “high” level of work motivation.

Respondents who were widow/er or separated ($\bar{x}=4.40$) had “very high” level of work motivation while those who were single ($\bar{x}=4.14$) and married ($\bar{x}=4.13$) had “high” level of work motivation.

Respondents who were master’s degree holders ($\bar{x}=4.27$) had “very high” level of work motivation while those who finished a bachelor’s degree ($\bar{x}=4.17$) and were not able to finish college ($\bar{x}=3.98$) had “high” level of work motivation.

Those who were permanent ($\bar{x}=4.20$) in their job had “very high” level of work motivation while non-permanent personnel ($\bar{x}=4.12$) had “high” level of work motivation.

Respondents who were in the service for 21 years and above ($\bar{x}=4.36$) and 11-20 years ($\bar{x}=4.21$) had “very high” level of work motivation while those serving the University for 10 years and below ($\bar{x}=4.08$) had “high” level of work motivation.

Those who were receiving Php20,001.00 and above ($\bar{x}=4.38$) had “very high” level of work motivation while those receiving Php10,000.00 and below ($\bar{x}=4.11$) and Php10,001.00-Php20,000.00 ($\bar{x}=4.10$) had “high” level of work motivation.

Job Performance of the Respondents when Grouped According to Variables

JOB PERFORMANCE	Frequency	Percentage
Excellent (4.20-5.00)	99	50.8
Very good (3.40-4.19)	90	46.2
Good (2.60-3.39)	6	3.1
TOTAL	195	100.0
MEAN = 4.19 (Very good)	SD = 0.42	

Job Performance

JOB PERFORMANCE	Frequency	Percentage
Excellent (4.20-5.00)	99	50.8
Very good (3.40-4.19)	90	46.2
Good (2.60-3.39)	6	3.1
TOTAL	195	100.0
MEAN = 4.19 (Very good)	SD = 0.42	

Female ($\bar{x}=4.22$) respondents had “excellent” job performance while and males ($\bar{x}=4.15$) had “very good.”

Respondents aged 41-49 years old ($\bar{x}=4.2$), 31-40 years old ($\bar{x}=4.21$), and 50 years old and above ($\bar{x}=4.2$) had “excellent” job performance while those aging 20-30 years old ($\bar{x}=4.17$) had “very good” job performance.

Respondents who were widow/er/separated ($\bar{x}=4.43$) and single ($\bar{x}=4.23$) had “excellent” job performance while married ones ($\bar{x}=4.15$) had “very good” job performance.

Those who were master’s degree holders ($\bar{x}=4.35$) had “excellent” job performance while those who finished only college ($\bar{x}=4.19$) and have no college degree ($\bar{x}=4.11$) had “very good” job performance.

Respondents with permanent ($\bar{x}=4.21$) employment status had “excellent” job performance while those who were not yet permanent ($\bar{x}=4.19$) in the job had “very good” job performance.

Those who have been serving the University for 11-20 years ($\bar{x}=4.25$) and 21 years and above ($\bar{x}=4.24$) had “excellent” job performance while those who have been in the service for 10 years and below ($\bar{x}=4.16$) had “very good” job performance.

Respondents receiving Php20,001.00 and above ($\bar{x}=4.30$) had “excellent” job performance while those receiving Php10,000.00 and below ($\bar{x}=4.18$) and Php10,001.00-Php20,000.00 ($\bar{x}=4.15$) had “very good” job performance.

A little over one-half (50.8%) of the respondents had “excellent” job performance. More than two-fifths (46.2%) had “very good;” and 3.1 percent, “good.”

Generally, the respondents had “very good” job performance. This shows that non-academic staff of CapSU are contributing to the University by giving their best in the work assigned to them.

Differences in the Level of Work Motivation when Grouped According to Variables

VARIABLES	STATISTICAL TOOLS	COMPUTED VALUE	SIG./P-VALUE
Sex	t-test	-0.940 ^{ns}	0.349
Age	ANOVA	2.184*	0.091
Marital Status	ANOVA	1.080 ^{ns}	0.342
Highest Educational Attainment	ANOVA	2.096 ^{ns}	0.126
Status of Employment	t-test	0.996 ^{ns}	0.320
Length of Service	ANOVA	3.234*	0.042
Basic Salary	ANOVA	3.426*	0.035

There were no significant differences in the level of work motivation of the non-academic staff of CapSU when grouped according to sex ($x=-0.940$; $p=0.349$), marital status ($x=-1.080$; $p=0.342$), highest educational attainment ($x=2.096$; $r=0.126$), and status of employment ($x=0.996$; $r=0.320$). This means that sex, marital status, highest educational attainment, and status of employment do not influence the level of motivation of the non-academic staff of the University.

However, significant differences in the level of work motivation were found when respondents were grouped according to age ($x=2.184$; $r=0.091$), length of service ($x=3.234$; $r=0.042$), and basic salary ($x=3.426$; $r=0.035$).

Older employees were found to be more motivated in their work than younger ones. This simply shows that they have learned to love their job and as they age they have developed the desire or willingness to work. This also implies that work motivation does not decline with age. This result affirms the findings of Boumans et al. (2011). They studied age differences in work motivation and job satisfaction: the influence of age on the relationships between work characteristics and workers outcomes. Their respondents were 1036 workers of a Dutch multinational organization. They results indicated that “the positive correlation between motivating potential scores and motivation was stronger for older than for younger employees.” They concluded that “older employees seemed to be more satisfied intrinsically with their jobs than younger employees.”

Those who have been serving the University for quite a long time had higher level of motivation than those who have been in the service for a short span of time. Length of service goes with age. As employees stay long in the service, they become older. Since older employees are more motivated than younger ones (Boumans et al., 2011), it can also be concluded

that the more they stay long in their job, the more they become motivated. They have enjoyed their job and the benefits they receive could have influenced them to work well. If they have no desire or willingness to do their job, they would have left and looked for another work.

Respondents’ basic salary also influenced their level of motivation. Those who were receiving bigger amount showed to have higher level of motivation than their colleagues not receiving as much as they do. This goes to show that salary is a factor that drives motivation among employees. The bigger amount they receive, the more they are motivated in their job. This result is supported by some findings of similar researches.

Differences in the Job Performance when Grouped According to Variables

VARIABLES	STATISTICAL TOOLS	COMPUTED VALUE	SIG./P-VALUE
Sex	t-test	-0.940 ^{ns}	0.349
Age	ANOVA	2.184*	0.091
Marital Status	ANOVA	1.080 ^{ns}	0.342
Highest Educational Attainment	ANOVA	2.096 ^{ns}	0.126
Status of Employment	t-test	0.996 ^{ns}	0.320
Length of Service	ANOVA	3.234*	0.042
Basic Salary	ANOVA	3.426*	0.035

There were no significant differences in the level of work motivation of the non-academic staff of CapSU when grouped according to sex ($x=-1.069$; $p=0.287$), age ($x=0.247$; $p=0.864$), highest educational attainment ($x=1.992$; $r=0.126$), status of employment ($x=0.325$; $r=0.745$), length of service ($x=0.909$; $r=0.405$), and basic salary ($x=1.380$; $r=0.254$). This means that sex, age, highest educational attainment, status of employment, length of service, and basic salary do not influence the job performance of the non-academic staff of the University.

On the other hand, there was a significant difference in the job performance of the respondents when grouped according to marital status ($x=2.357$; $r=0.097$). This means that job performance is affected by marital status. Respondents who are widow/er, separated, and single perform better in their job than those who are married. This may mean that employees who have no husband or wife can focus in their work and are able to give their best.

Relationship between Level of Work Motivation and Job Performance

VARIABLES	LEVEL OF MOTIVATION		JOB PERFORMANCE	
	r	r prob	r	r prob
Level of Motivation	1.00		0.548**	0.000
Job Performance	0.548**	0.000	1.00	

** - Significant at the 0.01 level (2-tailed)

There was a significant relationship between level of motivation and job performance, $r=0.548$, $p=0.000$. This implies that work motivation influences job performance. Employees who are highly motivated in their work are able to show excellent performance in their job. Motivation is important in order to come up with excellent results in the job.

IV. CONCLUSIONS

Based on the findings of the study, the researchers have come up with the following conclusions:

1. A bigger percentage of the respondents were females, 30-40 years old, married, bachelor’s degree holders, non-permanent, have been serving CapSU for 10 years and below, and earning Php10,000.00 and below.
2. Generally, the non-academic staff of CapSU have “high” level of work motivation. This implies that non-academic staff of CapSU are considerably motivated in their work. There is something that causes them to do the work assigned to them. Something, extrinsic or intrinsic, gives them the desire and willingness to do their job.
3. Overall, the non-academic staff of CapSU have “very good” performance in their job. It is always expected that employees should give the best of their ability in the work assigned to them. Interestingly, the non-academic staff of the University are doing very good, and this can contribute for the University to attain its goals.
4. There is significant relationship between level of work motivation and job performance. Employees who are highly motivated in their work are able to show excellent performance in their job. Motivation among employees is important because it can lead to better performance in their job.

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AUTHORS

First Author – Freden S. Delgado, Capiz State University, Poblacion Mambusao Campus, Mambusao, Capiz
Second Author – Felyn Mae G. Yap, Capiz State University, Poblacion Mambusao Campus, Mambusao, Capiz
Third Author – Rosemarie L. Luces, Capiz State University, Poblacion Mambusao Campus, Mambusao, Capiz

Evaluate the performance of the K-means method when increasing the sample Size (Applied to a Dataset package for diabetics)

Omer A.Khalid*, Mubarak H. Elhafian*, **, Afra H. Abdulatif*

* Department of Statistics, Sudan University of Science and Technology,
Khartoum, Sudan omer5bob@hotmail.com, hafian10@yahoo.com
Afra_hashim@sustech.edu

** Department of Mathematics,
Faculty of Science and Arts, King Abdul-Aziz University,
Jeddah, Kingdom of Saudi Arabia mhelhafian@kau.edu.sa

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ABSTRACT— *In this paper, we examined K-means clustering algorithm as one of the methods of data clustering and analysis process. The proposed study investigated the k-means algorithm with different size of samples. This study was tested the diabetes UCI standard dataset as case study. We start our experiments with 1015(Random number) sample size, and then we increase the sample size for each run by 1015 units. The elapsed time for each tested was calculated and reported for investigation process. Our investigation procedure was conducted using the R software. The One-Sample Kolmogorov-Smirnov Test used for examined the normality of the sample size and clustering processing time. The test proofed that the samples that we used is not distributed normally. In order to test the effect of the increase in sample size, we divided the samples into two groups: small samples (1015-15225) and large samples (17255-30450). Using a Mann-Whitney U test to test for a difference between the two groups, the median was found to be equal in the two groups. The correlation coefficient between time and sample size was also calculated and found to be weak. Our investigation shows that the efficiency of the k-means cannot influences with the sample size.*

Keywords— K-means; cluster analysis; Big Data; sample size, elapsed time

1. INTRODUCTION

Data represent the important aspect of any applied study. In our area there are a number of things such as Internet networks and other sources of information that contain data of various kinds images, videos, texts, numbers and other types of data. Different files that contain these data and different programs deal with them. The term large data (Big Data) appeared with the development of means of communication and information networks. The main problems of large data are data storage, data retrieval and statistical analysis. In our study, we will address the efficiency of statistical programs used in ordinary computers in data analysis when increasing sample size, this study we will be interested in the time it takes to implement the algorithms of cluster analysis. Cluster analysis is considered an important statistical analysis and has many uses in different fields. Many studies have been concerned with cluster analysis and the different ways of doing it. Most of the studies dealt with the use of algorithms, the different methods of cluster analysis, development of new algorithms and comparison between methods [1] [2] [3]. A few studies concerned the time and the improvement of the time of completion according to different method [4][5].

2. Basic Idea of Cluster analysis: "Cluster analysis" is the generic name for a wide variety of procedures that can be used to make a classification. These procedures empirically form "clusters" or groups of highly similar structure. More specifically, a clustering method is a multivariate statistical way that starts with a data set containing information about a sample of entities and attempts to reorganize these entities into relatively homogeneous groups [6][7]. There are many methods used in cluster analysis and the most important of these methods are the method of the K-means which is the most commonly used unsupervised machine learning algorithm for partitioning a given data set into a set of different grouped (k) groups, where k represents the number of clusters pre-specified by the researcher. It classifies units in

multiple clusters, such that data units within the same cluster are homogeneous. When we used the k-means clustering method, each cluster is represented by its center which corresponds to the mean of points assigned to the cluster [8][9]. When constructing partitions with a fixed number k of clusters, it is often assumed that there exists a function which measures the quality of different clustering of the same data set [10] [11]. For further information on clustering and clustering algorithms, see [12] [13] [14].

There are several k-means algorithms available. The standard algorithm is the Hartigan-Wong algorithm (1979), which defines the total within-cluster variation as the sum of squared distances Euclidean distances between items and the corresponding centroid [8] :

This method consists of its three simplest steps:

1. Divide values into primary groups.
2. Place each value in the group with the nearest Arithmetic Mean (usually using the Euclidean distance to calculate the distance either by actual observations or standard observations). We recalculate the arithmetic mean of the group to which the new item was added and the group from which the individual was lost.
3. Repeat the second step until the values distribution process stops. Instead of starting with the first step by dividing all the values into K from the averages of the initial groups, we can begin by specifying K (base points) and then implementing the second step.

The final distribution of data values depends, to a certain extent, on the groups on the first partition used or on the first choice of base points. Usually one does not know the number of clusters present in a data set. Because most partitioning methods provide a fixed number k of clusters, one must apply them for several values of k in order to find the most meaningful clustering [15].

In this study we will take care of the time of clustering .The following algorithm were used to calculate the time "Elapsed Time" variable as the total time from the beginning of the command until the end of it, to obtain the results we use the function proc.time ()where this function stores the timing in a variable immediately before the beginning of the implementation and then calculate the time after implementation and subtract the initial value of it to obtain the time taken where the output appears in the form of three values .As described in the following steps[10]

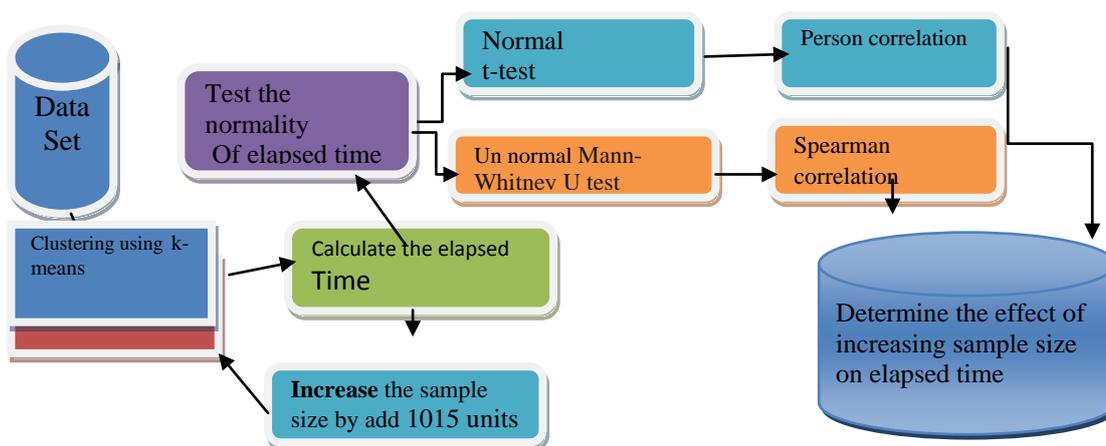
```
Start.point <- proc.time()
"Type your code here"
proc.time () – Start.point
Start.point ≡ "the time on Start".
```

Proc.time () ≡ "function retrieve the time from Windows".

Note: The three steps must be shaded at execution until the R program performs the steps sequentially [10][16].

3. Formulation of the Problem and proposed method of solution.

Previous studies have been concerned with cluster analysis and the algorithms used in the different methods. There are few studies that have studied this analysis in other sides. This study deals with the time taken to make the clustering for data set in case of increasing the size of the sample. The important question is whether the size of the sample affects the time taken to clustering data using the k-means method? Does analyzing big data in this cluster analysis by k-means method require a special type of computer or not?



The diagram above illustrates the steps that will be taken to study and analyze the study problem

4. Numerical results. To study our problem, we took data from the site of the center of learning machine and intelligent systems University of California .Data were collected during the period1999-2008 from 130 hospitals in the United

States. These data were prepared for the purpose of diabetes study. The total number of patients whose data are available is (101766) patients. The data included variables such as strain, age, sex, duration of stay in hospital, number of laboratory tests, Number of procedures (non - laboratory) performed by the patient during his stay in the hospital, Number of medical drugs, number of outpatient clinics, emergency visits per year before entering the hospital, Number of visits to the hospital [17].

Table (1):The variables

variable	Variable label	Percentage of missing values%
Strain	Strain patient	2
Sex	Type of patient as well as definition of non-identification type as an unknown value	0
Age	The age of the patient is divided into 10 categories of 10 years in each category from 0 to 100	0
Duration	The period of the patient's stay until he is out in the range between (1-14) days	0
Laboratory procedures	Number of laboratory tests performed for the patient	0
procedures	Number of procedures (non - laboratory) performed by the patient during his stay in the hospital	0
pharmaceutical	Number of medicines taken	0
Outpatient clinics	Number of visits to outpatient clinics within a year	0
Emergency visits	The number of emergency visits carried out by the patient during the year	0
Internal visits	Number of visits to the hospital	0

Table (4) illustrates the variables introduced in the research and their definition.

-To analyze the data the R Program (R-Programming) used to measure the time taken to cluster data set. In the beginning, a random sample of 1015 patients was selected and a cluster analysis was performed using the k- mean method. Through the algorithm `proc.time()` in the program R the time of implementation of this process was counted. Then we add the same number each time and repeat the previous steps each time. This process was carried out 30 times and the data obtained in the table (2).

We define the following variables

User: User times of the current R process

* System: System times of the current R process

* Elapsed: Time since the process was started

Table (5) shows the measurement of the time taken by the computer for the steps of the k-means method. The time was obtained in seconds with the sample size being increase by 1015 units each time

Table (2):The time of the K-means method in seconds with sample size

no	Sample size	K-means time			no	Sample size	K-means time		
		elapsed	system	user			elapsed	system	user
1	1015	0.05	0	0	16	16240	0.85	0.01	0.14
2	2030	0.01	0	0.02	17	17255	0.64	0	0.06
3	3045	0.03	0.01	0.01	18	18270	0.3	0	0.03
4	4060	0.02	0	0	19	19285	2.24	0.02	0.08

5	5075	0.01	0	0.01	20	20300	0.73	0	0.13
6	6090	0.01	0	0.01	21	21315	0.5	0.01	0.07
7	7105	0.02	0	0.02	22	22330	0.82	0.02	0.13
8	8120	0.02	0	0.02	23	23345	0.38	0	0.04
9	9135	0.05	0	0.01	24	24360	0.28	0.03	0.06
10	10150	0.34	0	0.05	25	25375	0.35	0	0.06
11	11165	1.09	0.01	0.06	26	26390	0.98	0.2	0.28
12	12180	1.29	0	0.03	27	27405	0.31	0	0.1
13	13195	0.64	0	0.06	28	28420	0.23	0.01	0.09
14	14210	0.89	0	0.06	29	29435	0.22	0.02	0.1
15	15225	5.03	0.02	0.06	30	30450	0.85	0.01	0.14

-To determine which test we were used we must test the normality of the data values .we use One-Sample Kolmogorov-Smirnov Test

Graph no (1):Goodness of fit for normal distribution

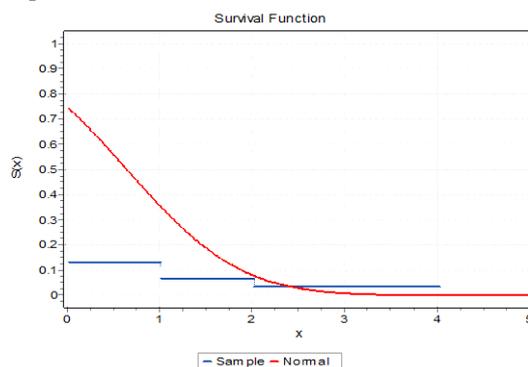


Table (3):One-Sample Kolmogorov-Smirnov Test

Hypothesis	Test value	P-value	Decision
Data are not distributed normally	0.25766	0.03035	Accept the hypothesis

Table (6) shows the Normality Test. the Sig for One-Sample Kolmogorov-Smirnov Test is equal to (0.03035) is less than 0.05 that lead us to accept the alternative hypothesis (the data are not distributed normally).

-To illustrate the relationship between the sample size and the elapsed time we compute the spearman rank correlation coefficient

Graph no (2)
 Relationship between elapsed time and sample size

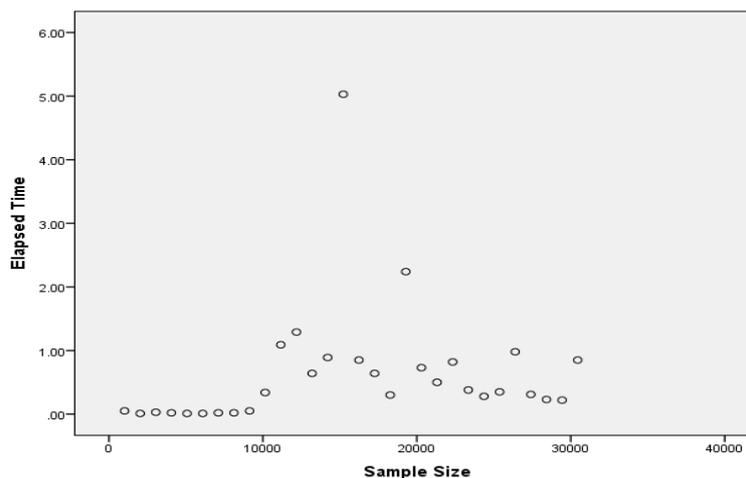


Table (4):Correlation coefficient

hypothesis	Correlation coefficient	p-value	Decision
There is no statistically significant relationship between time and sample size	0.477	0.359	Weak positive linear relationship

Through the linear correlation coefficient value, we observe that the correlation between the elapsed time and sample size is weak. And through the p- value (0.359) we note that it's greater than 0.05, which leads to the acceptance of null hypothesis and therefore there is no statistically significant relationship between time and sample size

-In order to test the difference between the median of elapsed time in small samples (1-15) and the median of elapsed time in large samples (16-30), the Mann-Whitney U test will be used because elapsed time does not follow normal distribution

Table (5):Statistics

The Measures	Mean	Median	Standard deviation	Lowest value	Highs value
Small Samples	0.6333	0.0500	1.29453	0.1	5.03
Large Samples	0.36543	0.5000	0.51226	0.22	2.24

Table 7 shows descriptive measurements of small and large samples

Table (6):*Nonparametric Tests: Mann-Whitney U test.

Hypothesis	p-value	Decision
The median of elapsed time in small samples equals the median time in large samples	0.143	Accept the null hypothesis

Table(6) shows that the p- value (0.143) is greater than 0.05. That means accept the null hypothesis (The median of elapsed time in small samples equals the median time in large samples or there are no significant differences between the median elapsed time in the small samples and the median elapsed time in the large samples).

5.Conclusion. To verify the hypothesis of this study that elapsed time is not affected by increasing the size of the sample, the samples were divided in to two groups large sample and small samples. Using the hypothesis tests it was found that the mean time for the small samples is not significantly different from the medium of the large samples. Also, using the correlation coefficient method to measure the degree and direction of the relationship between elapsed time and sample size, it was found that the relationship between elapsed time and sample size is a weak positive relationship. From the above, it can be said that when using the K-means method in cluster analysis, the sample size does not affect the elapsed time, which means that the efficiency of the k- means method is not decrease in the case of large samples.

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Design and Construction of Low Speed Axial Flux Generator with Stationary Bike

Toe Toe Hlaing

Department of Electrical Systems and Instrumentation, Myanmar Aerospace Engineering University, Meiktila Township, Mandalay Division, Myanmar

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Abstract- There are some rural areas in Myanmar where have no electricity. They rely on solar cells, small windmills, hydropower and generators which can produce electricity to use for domestic. Solar, Windmill and Hydropower depend on climate and Generator needs fuel to electrify. We cannot forecast the weather conditions and cannot afford the today's fuel price. This paper presents the design and construction of Low Speed Axial Flux Generator with stationary bike that utilizes locally available materials. This cannot depend on weather conditions, fuel and can use anytime at anywhere without pollution. By taking the stationary bike it will be like doing physical exercise which can lead us to being well. The goal is to design, fabricate and test the performance of the AFPM generator for renewable (Green) energy power generation. In this project, consists of three main parts: AFPM generator, stationary bike and control unit. AFPM generator contains two rotor disks, permanent magnets, stator support, windings, and car hub bearing. This AFPM generator is coreless generator which does not have any core in the stator. And then generating efficiency is high as there is no hysteresis loss. This generator attains a maximum efficiency of nearly 93%. This AFPM Generator can also be linked with Windmill, Hydropower and Stationary Bike to generate renewable electrical energy. The desired output electrical energy will be rectified and charged the 24V battery by digital charged controller. The battery will convert DC to AC with 500W Inverter to utilize rural electrification.

Index Terms- Coreless Axial Flux, Low Speed, Permanent Magnet, Rural electrification.

I. INTRODUCTION

In the last decade, the climate has changed in the world because of Global Warming. We are facing with the lack of mineral resources, thus people are searching the renewable energy (Green) with various ways. There are so many things that can generate renewable energy such as Solar, Windmill and Hydropower which are the most common ways. There are some rural areas in Myanmar where have no electricity. They rely on solar cells, small windmills, hydropower and generators which can produce electricity to use for household applications. Solar, Windmill and Hydropower depend on weather and location and Generator needs fuel to electrify. Weather condition cannot forecast exactly and fuel price is still rising nowadays. There is a better way that cannot depend on weather, location and fuel price it is connecting the generator with Stationary Bike. This can use

anytime at anywhere without pollution. By taking the stationary bike it will be like doing physical exercise which can lead people to being well and will convert the wasted energy into electrical energy. But this generator with stationary bike needs low speed only as people cannot take the bike with high speed like one thousand RPM. So Axial Flux Permanent Magnet Generator is being used for low speed application. Because of the permanent magnet that is the main items of this generator can effectively generate desired electrical power. The desired electrical energy will save in battery and use with Inverter for rural electrification. Thus AFPM generator with stationary bike is initial part and battery and inverter are the last part that can use household application. This is like Stand-alone systems.

II. DESIGN PROCESS FLOW

In this design approach the rated frequency is set to 50 Hz. The permanent magnets used in these designs are rectangular neodymium magnets (NdFeB) which are rare material used in the construction process of this Axial Flux Permanent Magnet Generator.

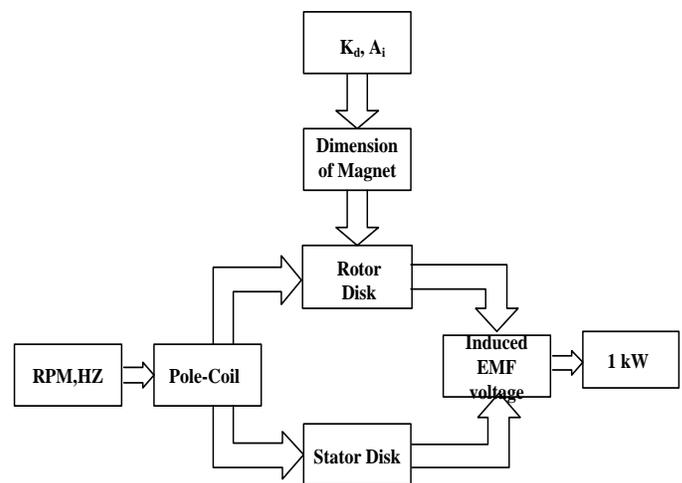


Fig.1 Process Flow

K_d is the magnet inner to outer diameters ratio. It is equal to 0.577 and can get the inner radius, outer radius and magnet length.

The parameter A_i is pole arc to pole pitch ratio and the value between 0.4 and 0.7 and can get magnet width is nearly equal to the pole arc.

A. Generator Fixed Parameter

The geometry of the AFPM generator is described in Figure2.

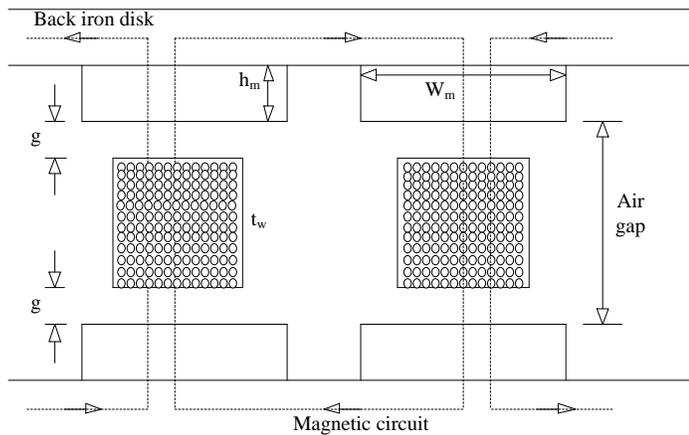


Fig.2 Top View of AFPM Generator System

The following dimensions are used during the design procedure.

In this project, AFPM generator has rated power 1 kW, rated speed 375 rpm, rated voltage 24 V, number of poles 16, 3 phase star connection and rotor diameter 300mm. For a coreless stator AFPM generator, the inner and outer radii of rotor disk are equal but stator disk is slightly larger than rotor disk. The diameter of hub bearing and shaft assembly is used the inner radius of rotor r_i

B. Generator Dimensions

The following equations are used for design of AFPM generator

Stator Axial Length, (L_s):

$$L_s = t_w \tag{1}$$

Rotor Axial Length, (L_r):

$$L_r = t_r + h_m \tag{2}$$

Effective Air-gap, (g_e):

$$g_e = 2h_m + 2g + t_w \tag{3}$$

Average Pole Pitch, (τ_p):

$$\tau_p = 2r \sin\left(\frac{\theta}{2}\right) \tag{4}$$

Where, r = magnet outer radius

Number of Stator Coils, (Q):

$$\frac{2Q}{3p} = 0.5 \tag{5}$$

Flux Density of the magnet, (B_m):

$$B_m = \frac{B_r h_m}{h_m + g + t_w} \tag{6}$$

Where, B_r is the remanent magnetic flux density

Number of Turns per Coil, (N_c):

$$N_c = \frac{\sqrt{2}E_f}{q \cdot 2\pi \cdot k_w \cdot \phi_{max} \cdot n \cdot \frac{p}{120}} \tag{7}$$

C. General characteristics of 1 kW AFPM generator

TABLE I
Generator Dimensions

Rotor	
Outer radius of rotor	150mm
Inner radius of rotor	86.6mm
Ratio of inner to outer rotor radius	0.577
Diameter of machine	300mm
Axial length of stator	17mm
Axial length of rotor	18mm
Axial length of machine	53.47mm
Thickness of rotor disk	9.5mm
Stator	
Air-gap between stator and rotor	1.5mm
Effective air-gap	35.47mm
Average pole pitch	58.53mm
Number of stator coils	12
Number of turns per coil	72
Flux density in the air-gap	0.5T

III. THE MANUFACTURING PROCESS

A. Winding coils

For winding the coils it is essential to carefully count the turns, to make sure one turn of copper conductor is set next to the other and to tense the conductor enough, as this results in less gaps in between the turns of copper conductors and thus more successful coils.



Fig.3 Two Strings 18 SWG wire 70turns winding

B. Constructing molds

A mould is a shaped container in which resin castings are formed. stator and rotor moulds were cut from plywood together with the stacks. The stacks are the boards serving as the lid and base of mould. The finished moulds for stator and rotor are shown below.



Fig.4 Stator mold



Fig.5 Rotor Mold

C. Constructing Rotor Disks

The rotor component consists of the two rotor disks, permanent magnets and the bearing assembly.



Fig.6 Completed Rotor Disk

D. Constructing Stator Disk

The stator consists of the windings and the epoxy resin winding support. The polyester epoxy mixture was made according to manufacturer's specifications and poured to make the stator cast. Fiber cloths were used to strengthen the cast. After a period of about 24 hours, the stator manufacture is completed. Three mounting holes equally spaced and matching those of the mounting frame were then drilled.



Fig.7 Completed Stator Disk

E. Axial Flux Permanent Magnet Generator

First, the car hub was inserted before being mounted onto the stator frame. And then inserting one by one the back rotor, stator

and front rotor respectively. Appropriate air-gap 1.5 mm between each rotor disk and the stator was observed. The final generator assembly is shown in the Figure below.



Fig.8 Completed AFPM Generator

F. Assembling the AFPM Generator with Stationary Bike

Finally the AFPM generator and stationary bike are assembled by gear ratio 3.3:1. Thus, we give 100 RPM for front driven, the rear driven will 330 RPM.

$$\text{Gear Ratios} = \frac{(\text{Front Gear Driven})}{(\text{Rear Gear Driven})} = \frac{48}{16} \times \frac{44}{40} = 3.3:1$$



Fig.9. Assembled AFPM Generator with Stationary Bike

IV. POWER CONTROL UNIT

The control unit as shown in Figure.10 consists of 8 Pin 12 V AC relays, bridge rectifier (Three-phase diode), charge controller, Ammeter, Volt-meter, inverter, dump load and fuse (circuit breaker). The relays choose the operation that is normally closed or open. This means that AC power will flow to the 3 phase rectifier which converts the AC power to DC or AC power will flow to the dump load which is delta connection stove coils. If the relays choose the normally closed operation, AC power will flow to the Ammeter and Volt-meter through bridge rectifier. And then DC output from the rectifier will flow to the Batteries (flowing in one direction) via charge controller to charge and the diodes in each bridge ensure that current will only flow in one direction into the battery and not discharge it. The connection of charge controller to batteries and batteries to inverter are such that the positive terminals are connected to

battery positive via the fuse while all the negative terminals are connected to the battery negative.

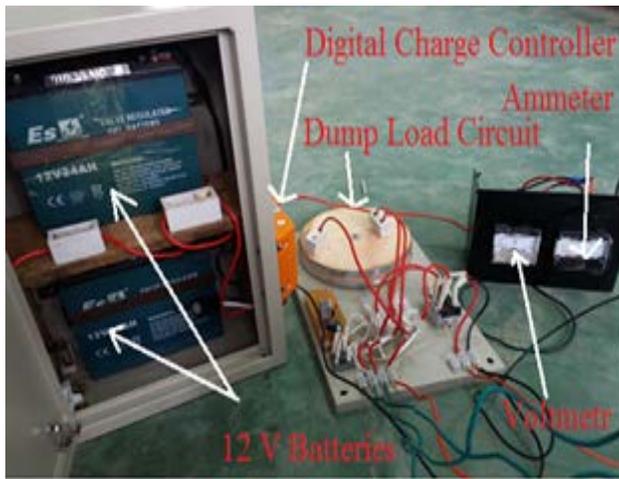


Fig.10 Power Control Unit

V. TEST FOR AFPM GENERATOR WITH STATIONARY BIKE

After assembly the whole power bike machine, the generator performance tests were started. There are two types of test that were carried out.

- a) No load test
- b) Load test

A. No-load Test Situation

Firstly, the AFPM generator is tested with no load for various speeds.

TABLE II
Output No load Voltages for Variable Speed

Speed (RPM)	Output (Voltage)
50	5
100	8
150	11.2
200	16.9
250	19.8
300	22.9
326	24
375	28.5

B. Load Test Situation

For 190 W Load, the following table is the value of voltage and current for variable speed

TABLE III
Load Test

Speed(rpm)	Voltage(V)	Current(A)
50	4.5	1.12
100	6.3	2.33
150	9	3.54
200	11.9	4.97

C. Household application

After testing this project, we will start using the household application for our country. The following table is the most common loads for rural electrification.

TABLE IV
Common Loads for Rural Electrification

Load	Quantity	Wattage	Time
TV(LED)	1	80W	6.25 h
Fluorescent Tube	1	34W	14.7 h
Sound Speaker	1	100W	5 h

VI. SPECIFICATION OF AFPM GENERATOR WITH STATIONARY BIKE

General Characteristics

Nominal Power	1kW
Nominal Frequency	50Hz
Pole Pair Number (p)	16
Coil Number (Q)	12
Air-gap between rotor and stator	1.5mm
Efficiency	93 %

Rotor Disks

Thickness	10mm
Outer Radius	150 mm
Inner Radius	86.5mm
Inner/Outer Radius (k_d)	0.577

Magnet

Length	49mm
Width	24mm
Thickness	9.5mm
Pole arc / Pole pitch (a_i)	0.41

Stator Disk

Axial Thickness (t_w)	16mm
---------------------------	------

Coils

Thickness of the coil	20mm
Number of turns per coil	70turns

Stationary Bike

Gear Ratio	3.3: 1
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Solar Charger Controller

Operating Voltage	12/24 V
Operating power	450 W

Battery

Operating Voltage	24V
Operating Current	24 Ah

Inverter

Operating power	500 W
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Over voltage Protection Circuit

Operating Voltage	> 28 V
-------------------	--------

Power Bike Machine

Rated Speed	375 rpm
Cut-in Speed	~150 rpm
Cut-off Speed	~200 rpm

VI. CONCLUSION

In this paper, the design and construction processes of AFPM generator with stationary bike (power bike machine) in rural electrification applications was made using simple methods, partially open source type, and simple construction techniques. The processes of this machine have proved to be easily applicable and understood. These constructed AFPM generators with stationary bike have proved to have strong designs. This machine is the portable type, so this can move at any places. This machine can be easily used by the adult person, and it cannot risk the person's safety. This machine can be easily modified by the technicians that construct them to suit local needs and use local materials with the basis for the formation of open source AFPM generator with stationary bike.

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AUTHORS

First Author – Toe Toe Hlaing, Lecturer, Department of Electrical Systems and Instrumentation, Myanmar Aerospace Engineering University, Meiktila Township, Mandalay Division, Myanmar and toetoe.mta@gmail.com

The Concept of Emic Knowledge of Bustaman in Surviving and Adapting as an Urban Kampong in Semarang, Indonesia.

Budi Sudarwanto*, Gagoek Hardiman**, Atiek Suprapti**, Agung B Sardjono**

* PhD student - Doctoral Program in Architecture and Urbanism Science of Architecture Department,
Faculty of Engineering, Diponegoro University.

** Promotor and Co-promotor - Doctoral Program in Architecture and Urbanism Science of Architecture Department,
Faculty of Engineering, Diponegoro University.

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Abstract-This research aims to describe and find the knowledge concept related to the the urban kampong's ability to survive and adapt through local economic culture. The research methods employed in this research were the ethnography and the grounded theory, and its process was done by applying qualitative research steps. The combination of both research techniques are formulated as 'QUAL + qual' in which the ethnography is the first method while the grounded theory is the second one. This research found that Bustaman is the kampong of curry. The curry goat is the local economic strength that gives contribution to Bustaman people in adapting and surviving. Kampong Bustaman is widely known as the Kampong of curry goat having a distinct historical value. Among Bustaman people, there are three concepts of knowledge that have become the local culture namely toil, togetherness, and openness which are accompanied with their awareness. This local knowledge has contributive value to the other urban kampongs and to the science of urban kampong space based on local wisdom particularly the one related to economic potency.

Keywords-emic knowledge, urban culture, Bustaman kampong,

I. INTRODUCTION

There are some descriptions about urban kampongs. Jo Santosa (2013) explained that urban kampongs, within global order, experience 'defensive' transformation, and Setiawan B (2013) gave additional description showing 'the disorder and the dirtiness' of urban kampongs' physical condition. On the other hand, Lana dan Heracles (2004) described the ability of urban kampongs to survive and adapt while Freek Colombijn (2007) also stated that urban kampongs are able to develop themselves based on their own local strength. The life interaction in urban kampongs is a complex problem related to social conflicts, social cohesion, public area disorder, and limited physical environment (Sihombing, A, 2004). Urban kampongs show a compact space structure, yet they have irregularity in organic forms (Roychansyah, 2009).

The researches about urban kampongs have shown substantial development. The latest research discusses transformation, integration, and adaptation of an urban kampong along with the research on urban kampong space itself. How do urban kampongs respond the global changes?

The researches that focus on urban kampongs' space are: the ambiguous space (Navastara AN et al, 2015), the green concept of kampongs' public space (Widharto SD et al, 2015), the co-habitation space (Prayitno B, 2017), the expression as transition room (Maliki NZ et al, 2014), the temporary public space (Sujatini S. et al, 2015). The research focus about the occurring change in urban kampongs' space was done by Funo S, et al in 2002 in their research about the changes and typhology of houses. Meanwhile, the research about the changes of traditional houses elements was done by Ryeung JS et al (2015). Furthermore, the researches about urban kampongs and about the phenomena of surviving urban kampongs were conducted by Hamidah N et al (2017) and Arlius Putra B (2013). There is also the research focusing on the classic knowledge of urban kampong people within physical design which was done by Adiyanti S (2012). In addition, Adianto J (2016) did a research in connection with 'land tenure security' and, he implicated it in urban kampongs. The status of land ownership has become a problem especially for urban kampongs people whose economic condition are limited.

The space of an urban kampong is researched from several points of view with different arguments. The space becomes an interesting issue related to the urban kampong topic. The space in an ambiguous meaning like green, sharing, transition, and temporary; moreover, the status of land ownership is a series of space meaning in an urban kampong. The changes and the knowledge concept are the wider research focus. The spaces of urban kampongs are learnt deeper in its occurring changes and its knowledge concept. The

changes are in its elements, typology, in how its survival and integration occur in this area, and in the existing concept. The knowledge concept is in the level of kampongs' physical design.

The research on Kampong Bustaman is the research about the culture of the kampong of curry and the new concept of knowledge which is initiated by its people to survive and adapt (Sudarwanto B. et al, 2018). Substantive knowledge in the field of urban kampong theory is based on local economy of the kampong in Semarang City. This research extends the knowledge concept of urban kampongs which are based on the local economy.

The researches on the urban kampong's space as a physical element particularly in open and public space have already been conducted many times. Navastara et al (2015) saw the ambiguity of public space in an urban kampong in Madura. The reason of this ambiguity is the obscurity of the structural function and use in the urban kampong's layout in which the road and activities of its people overlap each other. Sujatini S. et al (2015) explained that there is temporary characteristic in the urban kampongs' public area. She argued that all activities and physical elements are not legalistically supported and it can bring negative impacts. Sujatini S did the research on urban kampongs in Jakarta.

Prayitno B (2017) made a model of co-habitation. This model explained activities of sharing in the urban kampongs' life that are called 'guyub'. Guyub as the key word in Yogyakarta culture is developed within the future layout of its urban kampongs. The co-value on the principle of sharing is included in socio-economic and culture activities. The transition space in an urban kampong can be used as sharing space. Maliki N.Z. et al (2014) gave label to this transition space in the context of urban kampongs or kampong houses in Malaysia.

The meaning of kampong space as 'balik kampung' (go back to hometown) in the urbanization process is stated by Huzeima Nur MH and Hugh Byrd (2016). 'Balik kampung' is a de-urbanization event that can be seen easily. Azman Ahmad, (2013) explained the research result in Kampong Ayer (waterfront kampong in Brunei Darussalam) as a tourist destination. De Xuan Xiong (2018) conducted a research on the local food from kampongs that bring impact to the urban culinary and become favourite food in Singapura. Indrabakti S (2011) did a research on the behavior of Dayak people in adapting themselves to settle in river banks. The deepening of urban kampongs' space related to 'space-change-knowledge concept' develops. The space of urban kampongs becomes a discussion and debate in developing the knowledge. The interior of urban kampongs, which is then called Urban Kampong Space (UKS), is studied from different points of view. The research on UKS is related to the local economic culture, so the research on Bustaman focuses on the culture of its people based on local economy that can bring change in Semarang's urban kampongs.

Kampung Bustaman has a unique feature as a modern urban kampong. This area is labeled as 'the kampong of curry goat', and it shows that there is local potency. This local strength gives contribution to the existence and the survival of the kampong in the urban modernization era. The resilience of its people in working, the sense of togetherness when they interact socially, their open character, and their awareness are driving factors for these people to adapt and survive. This kampong, often called as the kampong of curry and the kampong of butchers, is one of acculturation phenomena that has happened in the city center of Semarang. Kampung Bustaman has historical values and artifact that build its character as the kampong of curry. Besides, the doers, the roles, and the physical remnants like the ex-slaughterhouse become the witness to the development of the recent Kampung Bustaman. The curry goat sellers have an important role in promoting this culinary in the city, and most of Semarang citizens know that Bustaman curry goat is the curry goat without coconut milk.

The last purpose of this research is to review an urban kampong space and its change in the context of local economic activities. Kampung Bustaman as the kampong of curry gives contribution to the enrichment of urban kampong architecture science which is based on local economic potency. The substance knowledge in the character development of Bustaman as the curry kampong is the part of knowledge system of urban kampong and its changes. The local economic potency as the sub-system that builds the knowledge structure is the curry goat without coconut milk.

II. RESEARCH METHODS

It's Bamkin M. et al (2016) used combination method from Ethnography and Grounded Theory in their research on children interaction in child mobile libraries in UK. Ethnography is able to direct the researchers to enter natural settings in order to comprehend the perception between the roles and the doers. Grounded theory is done to create emic knowledge concept of information induction that is collected. Simone F. Et al (2000) did a research on individual consumption preference. Ethnography was able to bring deep knowledge about what were bought or consumed by buyers in general consumption patterns while grounded theory gave substantive theory about consumption' behavior. Ethnography creates a setting or pattern of culture of certain group, and grounded theory received substantive knowledge concept of induction analysis of certain culture/group from the facts and data collected from the research field.

Goulding et al (2009) compared three qualitative research techniques namely grounded theory, ethnography, and phenomenology in relation to data collection, interpretation, and theory development. Ethnography focuses on culture and collected data form from

observation and interviews. Grounded theory is flexible towards data, but it is rigid with sample theory and data overload because the found knowledge concept must be expressed.

This research employed the aforementioned two qualitative techniques. Ethnography was used to describe the culture of Bustaman people as the member of the kampong of curry. Meanwhile, grounded theory was conducted to deepen the emic knowledge concept of Bustaman kampong in surviving on and adapting to the recent urban modernization. The data collection in both techniques is in the form of survey, in-depth interview, sketching, photography, and searching for related documents. In this research, the sample determination used the 'snowball random samplings' technique and interpretation and theory development were done through qualitative analysis processes. Data and information were classified, coded, analyzed to get data overload with iteration and triangulation processes.

Both techniques are different in analysis but same in their processes. The process of curry goat making becomes the 'pattern of core phenomena' of ethnography of kampong Bustaman while events and activities of this culinary become the 'axial coding' to get substantive knowledge of the kampong culture (Creswell, 2016). As many as 80 items of initial knowledge related to data/information were collected for further study. The data/information related to local economic aspects were: a. the history of Bustaman and curry goat, b. Curry goat without coconut milk, c. the processing and distribution of goat, d. the roles of women, and e. the space of activities related to curry. Social aspects of the kampong were: a. social interaction, b. socio-economic characters, c. old culture and new culture, d. the future kampong. The environmental aspects of the kampong were: a. the artifacts, b. Socio-economic spaces, c. infrastructures of the environment, and e. the scale of economic scale.

The application of both techniques developed two findings related to the culture and emic knowledge of Bustaman as the curry kampong. The existence and changes in this kampong were driven by local knowledge about the realization hard working of the people, their togetherness in developing local economy, and their awareness and openness towards external influences.

III. RESULTS AND DISCUSSIONS

A. *Bustaman as an urban kampong,*

References related to the phenomena of urban kampongs show some characteristics such as: first, that the old system does not directly adapt the new system, and it means the existence of an urban kampong is neglected and is not regulated in the new order hence the still existing old system among the grassroots. Second, an urban kampong is the result of pseudo-urbanization. The incoming people from rural areas are trapped in one transformation process because not all of them are fully welcomed in industrial sectors. These phenomena are indications of fragility of urban kampongs. The self-sufficiency was developed on the people's perception, collaboration of all parties, and external intervention in building the kampong. Third, an urban kampong is built on the socio-economic intensification, construction, and interaction of its people as a result of pseudo-organization.

Bustaman is one of urban kampongs that can survive and adapt to the modernization process in Semarang, why? Several urban kampongs had disappeared and only their name left like kampong 'morojayan', kampong 'petroos', kampong 'jayenggaten', and kampong 'basahan'. Furthermore, there are Kampong 'sekayu' and kampong 'petempen' that are at risk of disappearing due to the occurring changes in the city. Many urban kampongs that totally disappeared or only left their artifacts are the remainder of the city fragility. Urban kampongs have an important role in the city growth. How these kampongs do their roles? Bustaman is the urban kampong that still exists. Bustaman has general characteristics like densely populated area, chaotic and filthy environment, limited infrastructures, people categorized in lower socio-economic class, and nevertheless strong social cohesion. Bustaman is the urban kampong having a distinct phenomenon that makes it able to survive. Bustaman is well known as the kampong of curry goat that becomes the economic strength where all the necessary items and activities for making this culinary are available in this kampong

Bustaman has, according to history, experienced the up-and-down of its socio-economic life. Bustaman has historical values, and its name has been linked to the name of the great painter, Raden Saleh. The area of this kampong was a gift from the Dutch colonial government to Kiai Kerta Basa Bustam from Terboyo in return for his merits to the government. The kampong is administratively located at RT.04 and RT.05 in RW.03, Purwodinatan Village, Semarang City. This area is densely populated, and its infrastructures are limited. Most of its people work as small traders who sell food and beverages. The locality of Bustaman as the kampong of curry shows the potency to be self-sufficient. Jun Kitazawa a Japanese artist described Bustaman as a cage. (Hysteria 2017) An NGO, Hysteria in 2015 explained that there was a local strength that can create self-sufficiency in the future, and the NGO called it 'kininanti'. The kininanti cage is Sangkar/kandang kininanti is the label for Bustaman because its ability to survive and adapt. In 2017, this kampong received assistance through the program of thematic kampongs from the government, and this program gave incentive for Bustaman to repair its environment.

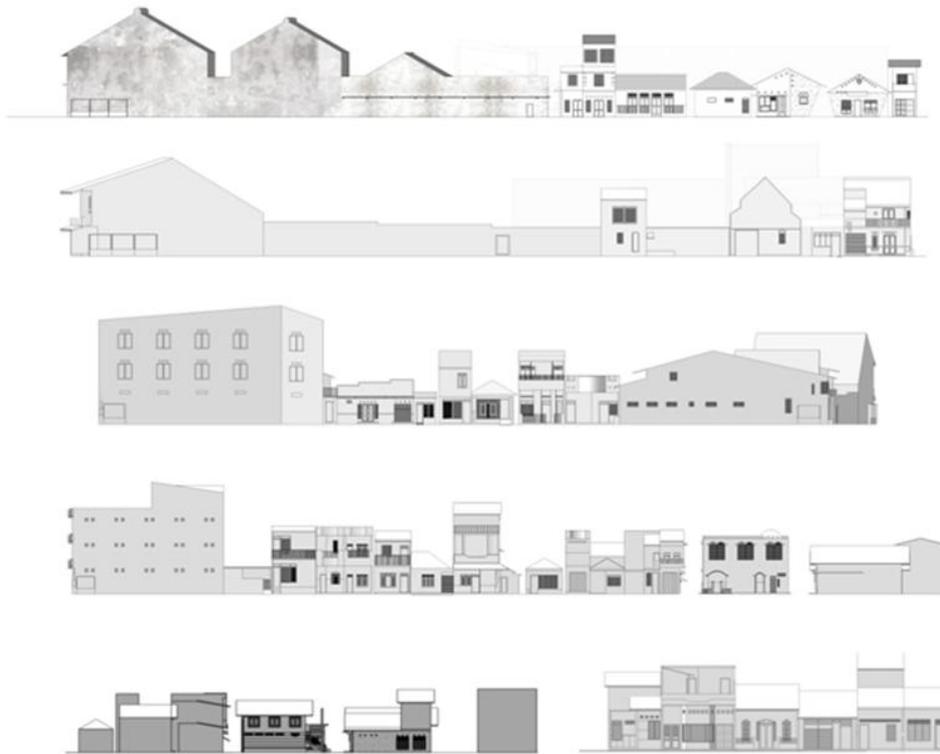


Figure 1 : Face of Bustaman as a urban kampong of the city of Semarang
(souch : field survey, 2018)

B. Bustaman as a local economic based urban kampong

The local economy of Bustaman able to make this kampong self-sufficient is the curry without coconut milk. This curry goat is different from other curries because it uses 'srandeng' (spicy fried coconut flakes made from sautéing grated coconut) instead of coconut milk which makes this culinary different. The distinct spice used is cardamom that is directly brought from Saudi Arabia. One ethnic settling in Bustaman, Koja, is the acculturation between Arabic and Javanese. Haji Yusup is one local figure in the economy of Bustaman who works as a butcher and blantik (goats brokers/sellers), and this person even cooks the curry that is managed by the third generation.

The doers and roles in this culinary involve Bustaman people. Beside haji Yusup, there is haji Toni who also works as blantik and has dominant role as a goat supplier. Haji Toni is able to provide around 70 goats each day while Haji Yusup can only provide 7 goats. Goats that have been cut are washed and taken by traders. Both haji Toni and haji Yusup sell based on the orders from the goat meat traders. Mr. Rizky, Mrs. Trisnanto, Mrs. Suliyah, and Mr. Iqbal are the goat meat traders who regularly supply goat meat to curry sellers. There are two types of curry sellers in Bustaman, the native sellers and the non-native sellers ('boro'). The curry is made without coconut milk. In the economic activities at Bustaman, there are supporting figures like seasoners, fur removers, skewers, goat keepers, cooks and meat slicers such as Mrs. Aisah, Sis. Roh, Sis. Istirokah, and Sis. Siti who works as seasoners and fur removers. All roles and doers are Bustaman people except some of Haji Toni's workers who live as a tenant in his boarding house.

The economic culture of the curry without coconut milk naturally forms an interconnecting structure between roles and doers during its process. These two systems are the processing system and the selling system of the curry goat. The processing is mostly handled by women while the selling is mostly done by men or boys. The social condition of the people is able to build social cohesion and interaction in the process of making the curry goat even though there are still social conflicts among teenagers, adults, and the formal committee (RT and RW).

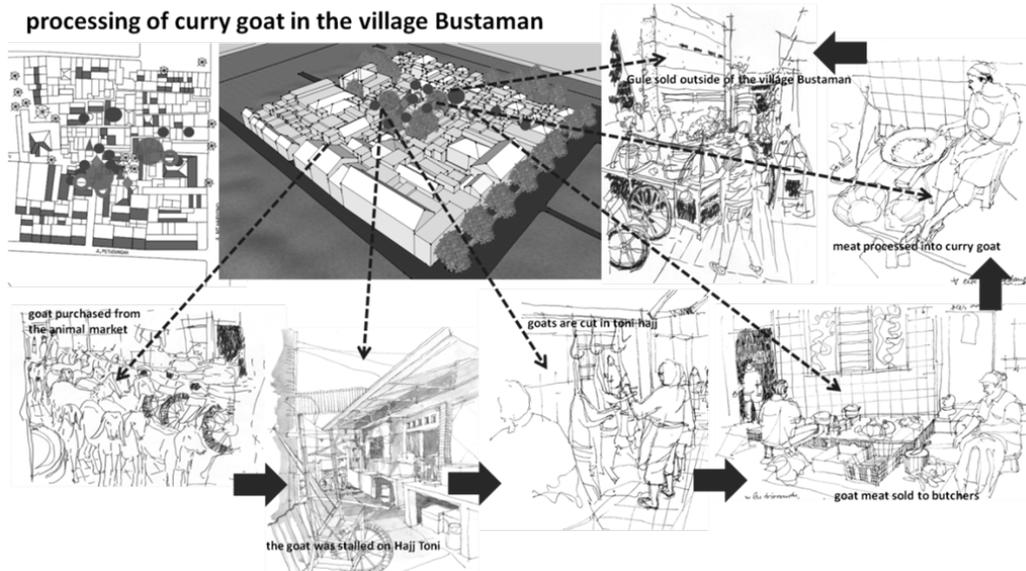


Figure 2 : The process of making goat curry without coconut milk
(Source: Field Survey 2017)

The economic activities make Bustaman experience space depression. Unpleasant smells from ditches and terraces that are utilized for cooking, and other economic activities are some events that make this kampong dynamic. Social interaction also creates disorder and complexity related to activity flow, and these phenomena create filthy and unhealthy. The efforts to make Bustaman interesting were done by creating murals. These murals also, the mirror of Bustaman's social and economic activities, improve the visual quality of the kampong.

In the middle of up-and-down situation, the local economic strength of Bustaman is able to bring change in this kampong. In this area, spatial changes do not occur at residential areas or elements and internal rooms (Funo S, dkk 2002), but they occur at terraces (Ryeung JS, dkk 2015). The terraces furthermore are utilized as a place to cook and to share space and time in selling food and beverages. Prayitno B (2017) called these places 'ruang guyub' (co-habitation) that occurs in private-public places. The previously mentioned co-habitation was driven by the royal palace, particularly Yogyakarta Royal Palace. On the other hand, for kampong Bustaman, it is driven by its people based on their awareness and togetherness to improve their economy.

The other prominent change is the existence of murals that shows their connection with the curry goat. The unpleasant smells and unhealthy environment are the weak points of this kampong. Kampong's spaces have different meaning on different context of approach. The ambiguous spaces in Kampong Madura occur because the function and the public space structure are not clear (Navastara et al, 2015). The migrants who come to the urban kampongs call it transition space (Maliki N.Z. et al, 2014). They need spaces to adapt in order to adjust themselves to urban life. The urban kampongs' contemporary spaces focus more on the temporary character of space's function and configuration. The absence of fixed character those spaces structurally and legally is defined by Sujatini S (2015) as the temporary public space or the third space.

The terraces, streets, and walls in Bustaman show the character of the third space with its uniqueness form of space related to the activities of making goat curry. The doers of economic activities are unaware that they have built a configuration and space structure in Bustaman. The infrastructures that are not optimal also influence the environment quality of the third space. Schematically the third space of kampong Bustaman is described below:

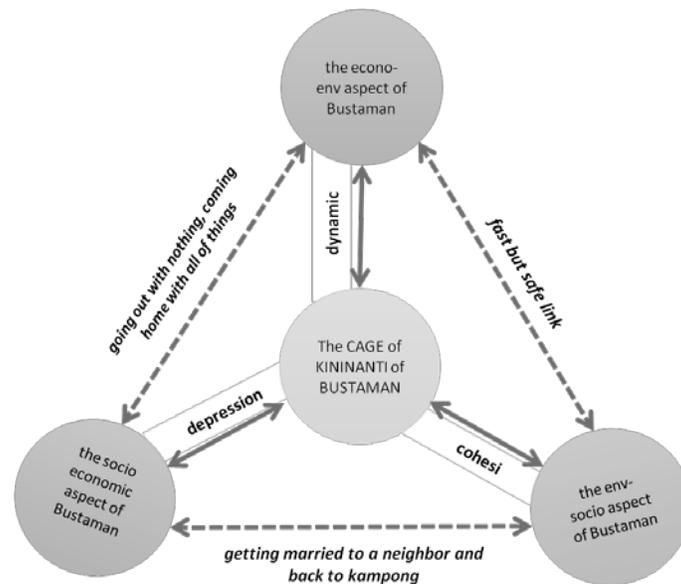


Figure 3: The scheme of third space based on the local economy of Bustaman
 (Source: the field survey, 2017)

Hamidah N. et al (2017) and Arlius Putra B. (2013) did a research on the integration of one urban kampong and the phenomenon of a surviving urban kampong. The integration of urban kampongs becomes the part of urban layout, and it is able to survive. The survival of an urban kampong shows an effort for values of urban kampongs such as togetherness, tradition, religion, and people’s improvement. Space integration in Bustaman and the efforts to survive in the scale of a city are realized in the context of local economic activities and local knowledge concept instead of physical characteristics. There are efforts to make Bustaman more open by creating traditional events like ‘gebyuran’ and ‘petengan’ in an event called Tengok Bustaman. This knowledge is explained in the next part.

C. Kampong space culinary based as the substantive theory

The knowledge concept of Bustaman’s space is based on economic activities namely curry goat culinary. There are there are threeconcepts of the local knowledge: a. ‘mangkat ndengkul mulih mikul’, b. ‘pek-nggo’, and c. ‘tembus tapi aman’. Each knowledge concept is the results of qualitative analysis of daily events in Bustaman. This research, previously mentioned, aims to find the knowledge concept of Bustaman in surviving on and adapting to modernization of Semarang City. This concept explains how Bustaman is able to survive on urban modernization process. Kampong Bustaman integrate and survive through its people’s culture in economic activities. ‘Mangkat ndengkul mulih mikul’ (going out with nothing, coming home with all of things) is an emic concept for Bustaman’s local economy. This concept explains about the totality of Bustaman people in working. These people, furthermore, start to work without bringing money, but after all day working the finally bring money to their homes.

This emic knowledge concept is a natural system of the kampong’s local economic activities. This economic system is unintentionally built by the habit of cooking and selling curry goat that are collectively done where there are some roles involved such as blantik, meat traders, seasoners, for removers, sellers, and cooks. Yan Song (2012) did a research on economic values related to the externality of houses’ price. This research assesed the impact of houses’ price on the economic function of an urban kampong space, and the houses’ price can be a parameter of an urban kampong space. The Bustaman’s concept of economic knowledge is the economic parameter of its activities valued from the price of one portion of curry.

‘Pek-nggo and pomah’ are emic concepts built by the structure and social construction of Bustaman people. This concept shows unity and togetherness of the people in fullfiling their needs and in facing the life changes occuring at the urban area. The kampong context is very strong in the pek-nggo dimension in which the cohesion and social capital are built even though some social conflicts still happen. The knowledge acquired has contemporary character. Pek-nggo means to have neighbors’ possession either formally or informally. Adiyanti S (2012) conducted a research collectively on local knowledge in designing process of an urban kampong. One of the findings related to the informal knowledge collection is mutual cooperation. One traditional clause in Javanese culture is to work collectively in spontaneity. Pek-nggo is also one Javanese traditional clause having unity and togetherness as its character, but it shows the formality character. There is a character of asking permission from the side whosepossession is going to take.

‘Tembus tapi aman’ (fast but safe link) is an emic concept of knowledge of Bustaman based on its physical concept and environment. The meaning of the concept shows that this kampong is safe, accessible, and open. The awareness and togetherness of

the people are the social capital to create safe, accessible, and open space that is then called BUSTAMAN. The structure and function of space that shows the kampong's dynamic changes from physics to impression on a scale of a city. Bustaman is easily accessed from Mataram street, Petudungan street, Petolongan street that has a shortcut to Kampong Pekojan (arabic kampong).

Arlius Putra B. (2013) explained that urban kampongs' ability to survive is the ability to produce and reproduce the value of spaces although they are limited. The system and form of urban kampongs are the urbanization system. The ability of an urban kampong' space to survive and adapt becomes significant when it is able to survive. The concept of 'tembus tapi aman' (safe but fast link) is a structural phenomena and space form of the kampong. The knots and networks through the kampong streets show the openness of this urban kampong. The integration of Kampong Bustaman into urban space is via the available access of the urban layout. Hamidah N et al (2017) mentioned in their research that one kampong integrates provided its space is compatible with the wider urban layout. Kampong Bustaman integrates itself into the urban layout of Semarang City using street layouts and available circulation, but this kampong still strives to improve its economic ability. Kampong Bustaman, well known for its curry, is a space integration form in the aspect of economic activities. The curry goat sellers spread themselves to several areas in Semarang.

IV. CONCLUSION

This research has succeeded to answer the research question that Bustaman, as the kampong of curry, has a concept of emic knowledge that becomes the reason why this kampong is able to survive and adapt. The knowledge concept, the finding, shows knowledge values about working hard, togetherness, awareness, and openness for an urban kampong that has been experiencing urban modernization. This concept gives enrichment to the existing field of substantive knowledge concept. The result of confirmation in the previous description shows a gap in the previous theory of urban kampongs, so this research, about the knowledge concept of urban kampong space based on local economic activities, can give contribution for the development of knowledge concept.

However, this research has some weaknesses related to the people's knowledge concept of space through local economic activities. This research has not been able to cover the physical element of the kampong. The kampong's weak physical elements, in addition to its weak economic activities, experience big pressure, so it makes the kampong chaotic and filthy. The future work is to conduct researches on urban kampongs that are based on advanced technology. The researches on urban kampong space are not only seen from social, economic, environmental, cultural aspects, but they are also seen from the use of the most recent technology applied as the research instrument.

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AUTHORS

First Author – Budi Sudarwanto, PhD-candidate, Architecture Department Faculty of Engineering Diponegoro University, email address: budisud@gmail.com..

Second Author – Dr. Ing. Gagoek Hardiman, Professor, Architecture Department Faculty of Engineering Diponegoro University, email address :ggkhar@yahoo.de.

Third Author – Dr. Atiek Suprpti, Associate Professor, Architecture Department Faculty of Engineering Diponegoro University email address : atiekbudiarto@gmail.com

Fourth Author : Dr. Agung B Sarjono, Associate Professor, Architecture Department Faculty of Engineering Diponegoro University email address : abskempung@yahoo.co.id

Correspondence Author – Budi Sudarwanto, email address: budisud@gmail.com, or : budi.sudarwanto@ft.undip.ac.id, mobil phone : 08122809066 or (82) (024) (6733746)

The First Record of *Aceria sacchari* Wangon, an Eriophyoid Mite, in Sugarcane Plantations in Sri Lanka

V.K.A.S.M. Wanasinghe*¹, K.M.G. Chanchala¹, D.Navia², L. Nugaliyadde³ and N.S.Aratchige⁴

¹ Sugarcane Research Institute, Uda Walawe, Sri Lanka

² Embrapa Recursos Genéticos e Biotecnologia, Brazil

³ Sri Lanka Organization of Agriculture Professionals, Department of Agriculture, Peradeniya

⁴ Coconut Research Institute, Bandirippuwa Estate, Lunuwila, Sri Lanka

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Abstract- Some warty patches slightly raised from the surface of the leaf sheath of some sugarcane plants in a sugarcane field at Sevanagala (6° 36' N, 80° 87' E), Sri Lanka, were observed during a field inspection in July 2016. These patches were irregular in shape and watery in appearance initially. Later, they become dry and reddish to dark red in colour. Microscopic examination on the damaged leaf sheaths showed large a population of minute mite. This study was conducted from July to September 2016 to identify this mite species and to investigate its damage symptoms and the occurrence in all sugarcane-growing areas in Sri Lanka. Two hundred specimens of the mite were sent to Embrapa Recursos Genéticos e Biotecnologia, Brazil, for identification. Fifty mite-infested plants from each age category, <5 months and >5 months, were inspected to study the damage symptoms and fifty randomly selected plants from each age group were inspected to record the damage incidence in the plantations in each sugarcane-growing site; Uda Walawe, Sevanagala, Pelwatte, Hingurana, Ethimale and Kantale. The specimens were identified as Sugarcane Blister Mite, *Aceria sacchari* Wang, 1964 (Acari: Trombidiformes: Eriophyidae). This is the first record of this mite on sugarcane in Sri Lanka. This mite has distributed in all sugarcane-growing areas in the country with different infestation levels. During the study period, the highest damage incidence on both age groups was recorded at Pelwatte while the lowest was at Hingurana.

Index Terms- *Aceria sacchari*, Eriophyoid Mite, Sugarcane Blister Mite, Sri Lanka

I. INTRODUCTION

Sugarcane is attacked by a variety of mites belonged to the Tetranychidae, Tarsonemidae and Eriophyoidea families. Most of these mites are considered as minor pests (Ozman-Sullivan *et al.*, 2006). Among them, researchers have given high priority to the family Eriophyoidea, a superfamily of [herbivorous mites](#), because it includes the smallest known species of mites and their damage is often attributed to other problems such as disease or malnutrition. The Eriophyoids are among the most diverse and economically important group of phytophagous mites. They are the highly-adapted plant-feeding mites living extremely intimate association with their host plants (Petanovic and Vidovic, 2009). They are among the smallest

arthropods in the world, and this is the key to their ecological success (Sabelis and Bruin, 1996).

So far, nine species of Eriophyoidea mites have been reported on sugarcane, namely *Abacarus delhiensis*, *Abacarus queenslandiensis*, *Abacarus doctus*, *Abacarus sacchari*, *Aceria sacchari*, *Aceria merwei*, *Cathetacarus spontanea*, *Catarhinus sacchari* and *Diptacus sacchari* (Ozman-Sullivan *et al.*, 2006; Navia *et al.*, 2011). *Abacarus doctus* is the only sugarcane-associated eriophyoid mite in Costa Rica (Navia *et al.*, 2011) and El Salvador (Guzzo *et al.*, 2014), causing clear symptoms of reddish or bronzed spots on the inner leaf surface, which is similar to those caused by rust fungi. Among them, the leaf vagrant, *Aceria sacchari* causes occasional chlorotic blotches on the leaves, which is symptomatically similar to the damage caused by thrips or some fungi. It is a potential vector of plant viruses, but the transmission mechanism has not been proven (Ozman-Sullivan *et al.*, 2006). It has been assumed as a possible vector of sugarcane streak virus (ChannaBasavanna, 1996).

After establishment of the commercial sugarcane cultivations in Sri Lanka in the early 1960s, only one species of sugarcane leaf mite of the family Tetranychidae (sugarcane yellow mite; *Oligonychus sacchari*) has been reported. They live and feed on the underside of leaves forming fine webs, in which eggs are laid and young nymphs develop. The affected leaves become discoloured and severe damage can result in dying leaves. A severe infestation of a mite species was observed on the variety SL 96 128 in 2012 and 2013 in the seedcane nurseries of the Lanka Sugar Company (Pvt) Ltd. Pelwatte, Sri Lanka. It was successfully controlled by the dominant biological control agent; *Stethorus* sp. (Coleoptera: Coccinellidae).

A hitherto unknown mite species living in distinct colonies on the inner surface of leaf sheaths of sugarcane was observed in July 2016 in sugarcane cultivations at Sevanagala (6° 36' N, 80° 87'E) in the dry zone, during a pest survey conducted by the Sugarcane Research Institute (SRI), Sri Lanka. Studies were conducted to identify this mite species and to investigate its damage symptoms and the occurrence in all sugarcane-growing areas in Sri Lanka from July to September 2016.

II. MATERIALS AND METHODS

Identification of the Mite Species

Two hundred specimens of the mite species were collected from infested leaf sheaths of sugarcane in the Research Farm of the Sugarcane Research Institute at Uda Walawe ($6^{\circ} 27'N$, $80^{\circ} 52'E$), Sri Lanka. The alcohol preserved specimens were dispatched to Dr. Denise Navia, Embrapa Recursos Geneticos e Biotecnologia, Brazil, for identification. The specimens were then slide-mounted in modified Berlese medium using a dissecting stereomicroscope and identified using a combined phase-contrast and differential interference contrast microscope (Nikon Eclipse 80i, Nikon, Tokyo, Japan).

Study on Damage Symptoms

Fifty mite-infested sugarcane plants from each age category, <5 months and >5 months, in the Research Farm at Uda Walawe, commercial sugarcane plantations at Sevanagala ($6^{\circ} 36' N$, $80^{\circ} 87'E$), Pelwatta ($6^{\circ} 45'N$, $81^{\circ} 14'E$) and Hingurana ($7^{\circ} 13'N$, $81^{\circ} 39'E$) and seed cane nurseries at Ethimale ($6^{\circ} 77'N$, $81^{\circ} 49'E$) and Kantale ($8^{\circ} 22'N$, $81^{\circ} 1'E$) were inspected and the damage symptoms were observed. Also digital photographs were taken and sent to Embrapa Recursos Geneticos e Biotecnologia, Brazil, for identification.

Incidence of the Mite Species in Sri Lankan Sugarcane-growing Areas

Field surveys were conducted in the research farm at Uda Walawe, commercial sugarcane plantations at Sevanagala, Pelwatta and Hingurana and seed cane nurseries at Ethimale and Kantale to study the damage incidence of the pest. From each location, 50 plants from the each age category (<5 months and >5 months) were randomly selected to record the damage incidence of the mite species by inspecting all the leaf sheaths. The percentage damage incidences in all the locations were estimated.

III. RESULTS AND DISCUSSION

Identification of the Mite Species

The mite species was identified as *Aceria sacchari* Wang, 1964 (Acari: Eriophyidae). This is the first report of *A. sacchari* from sugarcane in Sri Lanka. This species is commonly known as sugarcane blister mite, and it has been reported from India (Muthukrishnan, 1956), Indonesia, Java (Van Hall, 1923), Taiwan (Wang, 1964) and Queensland, Australia (Box, 1953). It is an interesting species having two female forms, one with slender body and 6-rayed feather claws and the other with thicker body and 7-rayed feather claws. The two forms are identical in all other features, such as shield design and setal pattern (Channa Basavanna, 1996). Also it has prodorsal shield with nearly complete median, admedian and submedian lines, lateral shield with granules, opisthosomal seta *e* (second ventral seta) much longer than seta *f* (third ventral seta) and empodium 6-7 rayed feather claws (Ozman-Sullivan *et al*; 2006).

Study on Damage Symptoms

The mite *A. sacchari* lives in distinct colonies on the inner surface of leaf sheaths. The infested areas can be seen as warty patches slightly raised from the surface (Blister) of the leaves. These patches are irregular in shape and watery in appearance initially. Later, they turn into reddish to dark red in colour and become dry (Figure 1, A and B). The feeding of *A. sacchari*

causes large spots with 1-2 cm diameter on both sides of sheaths. Hypertrophied spherical leaf blisters contain mite populations (Wang, 1964; Channa Basavanna, 1966; Jepson *et al.*, 1975).

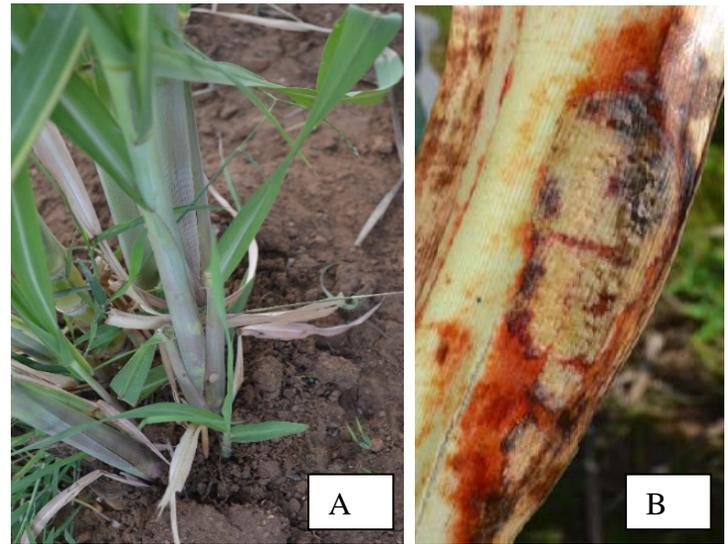


Figure 1: A-External appearance (warty patches) on sugarcane leaf sheaths infested by *A. sacchari*; B-Internal appearance of an infested leaf sheath

Most of the young (1-3 months old) sugarcane plants having “Dead Heart” symptom without the damages of sugarcane shoot borers; *Sesamia inferans* (Lepidoptera: Noctuidae) and *Chilo sacchariphagus* (Lepidoptera: Crambidae) were found to be infested with *A. sacchari*. It may be due to the infestation of the *A. sacchari* because the damage on the leaf sheath due to sugarcane blister mite can predispose to the infection of the damage site by saprophytic fungi such as *Gleosporium* sp., *Fusarium* sp. and *Alternaria* sp. (Muthukrishnan, 1956).

Incidence of the Mite Species in Sugarcane-growing Areas

Infestations of *A. sacchari* were observed in all the inspected sugarcane fields at Uda Walawe, Sevanagala, Pelwatta, Hingurana, Ethimale and Kantale. The highest percentage damage incidences for each age category were recorded at Pelwatta (99% at <5 months age and 98% at >5 months age) the lowest was at Hingurana (79% at <5 months and 81% at >5 months old crop). It indicated that *A. sacchari* has spread into almost all sugarcane-growing areas in the country with different infestation levels.

IV. FUTURE PROSPECTIVES

Identification of the morphological, biochemical and physiological characters of susceptible and tolerant/resistant varieties are important for developing tolerant/resistant varieties. It is also necessary to identify potential biological control agents against *A. sacchari* and to study their bio-ecology to establish a successful biological control programme. Predatory mites with flat idiosoma such as *Neoseiulus paspalivorus* which have been reported to be associated with plants in the Graminae family

would hold some promise. Eriophyoid mites are easily overlooked and can be disseminated through propagation material (Navia *et al*, 2011). Therefore, it is very important that the sugarcane germplasm exchanged in the form of stalk pieces among the countries should be free of eriophyoid mites to avoid the dissemination of *A. sacchari* to other countries

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AUTHORS

- First Author** – V.K.A.S.M. Wanasinghe, Sugarcane Research Institute, Uda Walawe, Sri Lanka
Second Author – K.M.G. Chanchala, Sugarcane Research Institute, Uda Walawe, Sri Lanka
Third Author – D.Navia, Embrapa Recursos Geneticos e Biotecnologia, Brazil
Fourth Author – L. Nugaliyadde, Sri Lanka Organization of Agriculture Professionals, Department of Agriculture, Peradeniya
Fifth Author – N.S.Aratchige, Coconut Research Institute, Bandirippuwa Estate, Lunuwila, Sri Lanka

Co-Culture of Red Seaweed (*Gracilaria tenuistipitata*) and Black Tiger Shrimp (*Penaeus monodon*) with Different Feeding Rations

Nguyen Thi Ngoc Anh, Luong Thi Hong Ngan, Nguyen Hoang Vinh, Tran Ngoc Hai

College of Aquaculture and Fisheries, Can Tho University, Can Tho city, Vietnam

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Abstract - The study was performed to assess the effects of different feeding rations on growth and feed efficiency of the black tiger shrimp (*Penaeus monodon*) co-cultured with red seaweed (*Gracilaria tenuistipitata*) in tanks. Shrimp was mono-cultured and fed commercial feed (CF) to satiation considered as a control and the five other treatments, shrimps were co-cultured with red seaweed (1 kg m⁻³) and received CF at 100%, 75%, 50% and 25% and 0% feed ration of the control. Juvenile shrimps with mean initial weight of 0.46-0.51 g were run in triplicate and stocked at a density of 100 ind. m⁻³, and at salinity of 15 ppt. After 60 days of culture, water quality parameters in terms of nitrogen compounds (TAN, NO₂⁻ and PO₄³⁻) in co-culture tanks were significantly (p<0.05) lower than those in the monoculture. Survival of shrimps varied in the range of 45.00-98.33%, of which the treatment without feeding (0% feed ration) was lowest and significantly different (P<0.05) from the other treatments. Growth rate and productivity of shrimps in co-culture fed from 50% to 100% satiation were statistically higher (p<0.05) than those in the control group, and the feed cost could be reduced from 40.89% to 69.94%. Proximate composition of shrimp meat such as moisture, protein and ash were similar among treatments except lipid content was significantly lower and red coloration of shrimp after boiling was markedly darker in co-culture than those in the control. These results indicated that co-culture of *P. monodon* and *G. tenuistipitata* with reduction of feeding ration up to 50% satiation resulted in improvement of growth, feed cost, and shrimp color as well as maintain better water quality in the culture tanks.

Index Terms – Co-culture, *Penaeus monodon*, *Gracilaria tenuistipitata*, feed cost, growth rate, water quality

I. INTRODUCTION

The black tiger shrimp (*Penaeus monodon*) has high economic value, and is one of the important cultured species in the Mekong delta, Vietnam. However, intensification of shrimp farming has caused soil and water pollution (Lan, 2013). Moreover, feed cost occupies large proportion in the intensive shrimp farming system, accounted for 58% of the total production cost (Hung and Quy, 2013). Previous studies found that integrated/co-culture system of seaweed with fish/shrimp gave several benefits such as reducing the risk of ecological impacts, improving the yield of both primary and secondary production, and maintaining optimum water quality (Troell, *et al.*, 2009; Jaspe *et al.*, 2011; Susilowati, *et al.*, 2014; Samocha, *et al.*, 2015; Tsutsui, *et al.*, 2015, Anh and Ngan, 2017). It also effectively utilizes the different natural food present in the production area, thus improving efficiency of converting available resources to the product.

Red seaweed *Gracilaria* is a genus with a large number of species, they are euryhaline and found in brackish water with wide salinity range. These species have played an important role in the production of agar as well as high absorption of nutrient in water body (FAO, 2003; Hau and Dai, 2010). Other study reported that *Gracilaria cervicornis* could partially substitute for the industrial feeds used in shrimp (*Litopenaeus vannamei*) farming (Marinho-Soriano *et al.*, 2007), and survival, growth and production of *L. vannamei* were improved in polyculture with *Gracilaria verucosa* (Susilowati, *et al.*, 2011). Moreover, *Gracilaria tikvahiae* cultured with the shrimp *L. vannamei*, this seaweed absorbed nearly 35% of the nitrogen input by shrimps within 18 days of experiment (Samocha, *et al.*, 2015). Recently, red seaweed (*Gracilaria tenuistipitata*) has been found abundantly with other seaweed species in the improved extensive shrimp farms from Bac Lieu and Ca Mau province, and are believed to be good for shrimps (Anh, *et al.*, 2017). Therefore, the aim of this study was to assess the effects of different feeding rations on growth and feed efficiency of the black tiger shrimp (*Penaeus monodon*) co-cultured with red seaweed (*Gracilaria tenuistipitata*) in tanks. These works could provide useful information for further research in field conditions that contribute to develop sustainable shrimp farming in Mekong delta of Vietnam.

II. MATERIALS AND METHODS

Source of experimental shrimp, red seaweed and commercial feed

The black tiger shrimp postlarvae from one single batch were purchased from a commercial hatchery in Bac Lieu province and reared in 2 m³ tank for 3 weeks to obtain juvenile stage with individual weight of about 0.5 g.

Red seaweed (*Gracilaria tenuistipitata*) was collected in the improved-extensive shrimp farm from Bac Lieu province, Vietnam and then red seaweed was separated from other seaweeds and acclimated to adapt experimental salinity for 5 days. Commercial feed (GROBEST LANDFOUND No. 2 and No. 3) is produced by Grobest Company, Dong Nai province, Vietnam.

Table 1 Proximate composition of *Gracilaria tenuistipitata* (% dry matter) and commercial feed

Feed type	Moisture	Protein	Lipid	Ash	Fiber
<i>Gracilaria</i> sp.	85.44	12.34	1.36	28.47	10.26
Grobest feed*	≤11	≥42	5-7	≤15	≤3

* Information based on label from Grobest Company

Experimental design

The experiment was carried out for a period of 60 days at the College of Aquaculture and Fisheries, Can Tho University, Vietnam. Six feeding treatments were randomly designed in triplicate. Shrimp was mono-cultured and fed commercial feed (CF) to satiation considered as a control, the other five treatments; shrimps were co-cultured with red seaweed (*Gracilaria tenuistipitata*) and fed at the rates of 100%; 75%, 50%, 25% and 0% (without receiving CF) feed ration of the control. These treatments were as follow:

- Mono-culture shrimp _feeding to satiation (Control)
- Shrimp+ *G.tenuistipitata* _ 100% feeding rate of control (G+100%C)
- Shrimp+ *G.tenuistipitata* _ 75% feeding rate of control (G+75%C)
- Shrimp+ *G.tenuistipitata* _ 50% feeding rate of control (G+50%C)
- Shrimp+ *G.tenuistipitata* _ 25% feeding rate of control (G+25%C)
- Shrimp+ *G.tenuistipitata* _ 0% feeding rate of control (G+0%C)

Experimental system and management

The experimental system was set up under transparent roof, juvenile shrimps with mean initial weight of 0.46-0.51g were stocked at density of 100 ind. m⁻³ in the 150-L tanks at salinity of 10 g L⁻¹, and all culture tanks were provided continuous aeration. For co-culture, the red seaweed *G. tenuistipitata* (1 kg m⁻³) was distributed in each tank. Shrimps were fed four times a day at 7:00, 11:00, 15:00 and 19:00 h. The feeding ration were based on the allocated treatments and the commercial feed (Growbest) was used for the black tiger shrimp at different developmental stages as recommended by the manufacturer. Water exchange was done every 10 days, about 30% of the tank volume.

Water quality

Daily water temperature and pH in the culture tanks were recorded at 7:00 and 14:00 hours using a thermo-pH meter (YSI 60 Model pH meter, HANNA instruments). Alkalinity was measured by test kit (Sera, Germany). The concentrations of TAN (NH₃/NH₄⁺), NO₂⁻ and PO₄³⁻ were determined at a 20-day interval using a spectrophotometer according to American Public Health Association (APHA, 1998).

Growth rate and feed utilization

To determine the growth performance during the feeding trial, initial and final as well as intermediate samples were taken to measure average individual shrimp weight. Sampling was done at a 20-day interval. Ten shrimps in each tank were randomly taken and weighed in groups using an electronic balance with an accuracy of 0.01 g and then the shrimps were returned to the original tanks. At the end of experiment, all shrimp was individually weighed and the survival was calculated.

Growth data of experimental shrimps consisting of weight gain (WG), daily weight gain (DWG), specific growth rate (SGR) and survival; feed conversion ratio (FCR) calculated using the following equations:

$$\text{Weight gain (g)} = \text{Final weight} - \text{Initial weight}$$

$$\text{DWG (g/day)} = (\text{final weight} - \text{initial weight}) / \text{cultured days} \times 100$$

$$\text{SGR (\%/day)} = ((\ln \text{ final weight}) - (\ln \text{ initial weight})) / \text{cultured days} \times 100$$

$$\text{Survival (\%)} = \text{Final number of shrimp} / \text{Initial number of shrimp} \times 100$$

$$\text{FCR} = \text{Feed provided (dry weight)} / \text{Weight gain (wet weight)}$$

Criteria for evaluating shrimp quality

Texture and proximate composition of shrimp meat, and color of boiled shrimps were determined at the end of experiment. Experimental shrimps in each treatment were cooked for 5 minutes and shrimp sample was taken in one photo for comparing the color among treatments. Proximate analysis (moisture, crude protein, lipid, fiber and ash) of red seaweed and shrimp meat were carried out according to the standard methods of Association of Official Analytical Chemists, AOAC (2000). Texture of shrimp meat was measured by the TA.XT plus texture analyzer (Stable micro system YL, UK).

Statistical analysis

The percentage values were normalized through arcsine transformation before statistical analysis. For all treatments, results were analyzed statistically with one-way ANOVA analysis of variance to find the overall effect of the treatment (SPSS, version 16.0). TURKEY test were used to identify significant differences between the mean values at a significant level of $p < 0.05$.

III. RESULTS

Water quality parameters

During culture period, the average water temperature and pH were in the ranges of 26.2-29.3°C and 8.1-8.4, respectively. The mean alkalinity fluctuated from 119.3 to 133.7 mgCaCO₃L⁻¹ (Table 2). Generally, the temperature, pH and alkalinity were similar among treatments.

Table 2 Average temperature, pH and alkalinity during culture period

Treatments	Temperature (°C)		pH		Alkalinity (mgCaCO ₃ L ⁻¹)
	7:00	14:00	7:00	14:00	
Control	26.3±0.6	29.1±0.7	8.1±0.3	8.4±0.2	123.3±10.8
G+100%C	26.2±0.6	29.1±0.6	8.1±0.2	8.4±0.2	125.3±12.7
G+75%C	26.2±0.7	29.3±0.8	8.1±0.2	8.4±0.2	123.8±14.7
G+50%C	26.3±0.8	29.1±0.7	8.1±0.2	8.3±0.2	133.7±13.4
G+25%C	26.3±0.7	29.0±0.6	8.1±0.2	8.4±0.2	119.3±12.7
G+0%C	26.3±0.7	29.2±0.7	8.1±0.3	8.4±0.2	125.3±12.7

Previous study reported that the black tiger shrimp could tolerate a wide range of temperature from 23°C to 34°C, the optimal range was 26- 29°C, and pH range to maintain the good performance of shrimp was 7.5- 8.5 (Pushparajan and Soundarapandian, 2010). In the present study, temperature and pH were in the suitable range for normal growth of tiger shrimp. According to Tao (2015), the appropriate range of alkalinity for postlarvae of tiger shrimp was 110-120 mgL⁻¹. The alkalinity in the experiment was slightly higher than the recommended values that might not cause negative effects on shrimp performances.

The mean levels of TAN and NO₂⁻ in the culture tanks varied in the ranges of 0.05-1.09 mgL⁻¹ and 0.03-4.24 mgL⁻¹, respectively (Table 3). These parameters tended to decrease with reducing feeding ration, of which the highest concentration was found in the control with satiation feeding regime, followed by the co-culture with 100%, 75%, 50% and 25% feed ration of the control and the lowest value was observed for the co-culture without feeding. There were significantly different among treatments ($p < 0,05$).

Table 3 The concentrations of TAN, NO₂⁻ and PO₄³⁻ during culture period

Treatments	TAN (mgL ⁻¹)	NO ₂ ⁻ (mgL ⁻¹)	PO ₄ ³⁻ (mgL ⁻¹)
Control	1.09±0.63 ^a	4.24±2.24 ^a	0.49±0.15 ^a
G+100%C	0.51±0.31 ^b	2.16±1.21 ^b	0.29±0.12 ^b
G+75%C	0.38±0.20 ^c	2.03±0.97 ^b	0.22±0.03 ^{bc}
G+50%C	0.27±0.14 ^{cd}	1.12±0.59 ^c	0.19±0.07 ^{cd}
G+25%C	0.18±0.10 ^d	0.88±0.59 ^c	0.17±0.07 ^{cd}
G+0%C	0.05±0.01 ^e	0.03±0.02 ^d	0.07±0.03 ^e

Values are mean ± standard deviation. Mean values with different superscripts in the same column are significantly different ($P < 0.05$)

Previous studies revealed that the toxicity of ammonia and nitrite for shrimp is greatly dependent on environmental factors such as pH, dissolved oxygen, salinity, and temperature (Chen and Lei, 1990; Whetstone, *et al.*, 2002). In aquaculture, these factors play an important role in the development, growth, and survival of species exposed to ammonia and nitrite. Appropriate levels of TAN and nitrite for culturing juvenile of *P. monodon* (0.27 g) were 3.7 mg L⁻¹ and 3.8 mg L⁻¹, respectively (Chen and Lei, 1990). Therefore, the concentration of TAN and NO₂⁻ in the control treatment was still in the tolerant level of *P. monodon*. Moreover, the contents of PO₄³⁻ in the culture tanks followed similar pattern as observed for TAN and NO₂⁻. The highest PO₄³⁻ level was also found in the control and then gradually reduced with decreasing feed ration, and the lowest level was observed in the co-culture with no feeding. Statistical results revealed that mono-culture tanks had significantly higher value of PO₄³⁻ compared to the co-culture treatments. The study of Kasnir *et al.* (2014) reported that the criteria concentration for PO₄³⁻ in shrimp pond was 0.05 - 0.5 mg L⁻¹, so the amount of phosphate in the control was still in the

It is well known that *Gracilaria* species have been used as biofilter to improve water quality in aquaculture system (FAO, 2003; Susilowati, *et al.*, 20). The study of Marinho-Soriano *et al.* (2009) revealed that red seaweed (*Gracilaria birdiae*) had high biofiltration capacity which help to significantly reduced concentrations of the three nutrients analyzed (PO_4^{3-} , NH_4^+ and NO_3^-) over the study period. The concentration of PO_4^{3-} decreased by 93.5%, NH_4^+ by 34% and NO_3^- by 100% after the 4-week experimental period. Additionally, Hau and Dai (2010) stated that red seaweed *Gracilaria* species have ability to absorb nutrient excessive their requirement. Abreu *et al.* (2011) also found that *Gracilaria* sp. was the most efficient biofilter and very useful in ecological engineering application.

The results of the current study are in agreement with the results from Anh, *et al.* (2014), authors stated that the contents of TAN and NO_2^- in the co-culture of the white leg shrimp (*Litopenaeus vannamei*) with gut weed (*Enteromorpha* sp.) or green seaweed (Cladophoracea) were considerably lower than those in the mono-culture. Similar finding showed that the macroalga *Gracilaria tikvahiae* cultured with the shrimp *L. vannamei* in an integrated multi-trophic Aquaculture (IMTA) system. This species uptake nearly 35% of the nitrogen input by shrimp within 18 days of experiment that helped to improve water quality (Samocha, *et al.*, 2015).

Growth rate

Results showed that growth in weight of experimental shrimps was affected by different feeding regimes from day 20 onwards. At day 20, the mean weight of shrimps attained 0.86-2.63 g, of which the lowest and highest values were observed for the G+0%C treatment (co-culture without feeding) and the G+50%C treatments (co-culture with 50% feed ration of the control), respectively. The control treatment showed intermediate value, this tendency was found at day 40 (1.82-4.68 g) and day 60 (Figure 1).

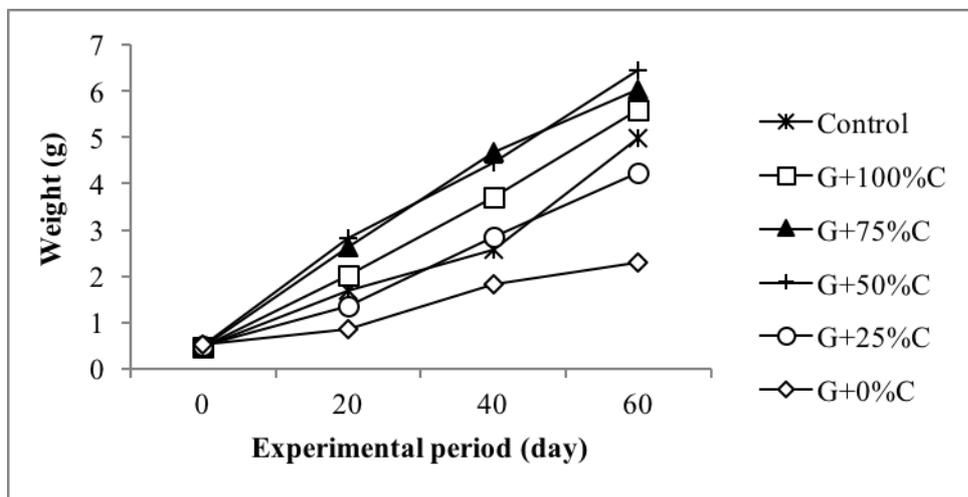


Figure 1 Variation in weight of shrimp during culture duration

Table 4 Shrimp performances after 60 days of culture

Treatment	Control	G+100%C	G+75%C	G+50%C	G+25%C	G+0%C
IW (g)	0.47±0.03 ^a	0.46±0.03 ^a	0.48±0.02 ^a	0.49±0.04 ^a	0.49±0.03 ^a	0.51±0.02 ^a
FW (g)	4.97±0.19 ^a	5.58±0.08 ^b	6.03±0.40 ^{bc}	6.44±0.21 ^c	4.22±0.12 ^d	2.30±0.1 ^e
WG (g)	4.51±0.19 ^a	5.12±0.08 ^{ab}	5.55±0.40 ^{bc}	5.95±0.21 ^c	3.73±0.12 ^d	1.94±0.2 ^e
DWG (g day ⁻¹)	0.075±0.003 ^a	0.086±0.002 ^{ab}	0.092±0.007 ^{bc}	0.099±0.003 ^c	0.062±0.002 ^d	0.032±0.004 ^e
SGR (% day ⁻¹)	3.92±0.06 ^a	4.13±0.02 ^b	4.19±0.11 ^b	4.27±0.06 ^b	3.54±0.04 ^c	2.39±0.10 ^d
IL (cm)	3.41±0.2	3.31±0.18	3.44±0.19	3.32±0.17	3.34±0.21	3.30±0.20
FL (cm)	7.77±0.94 ^a	8.06±0.98 ^{ab}	9.23±1.01 ³	9.35±1.01 ^b	7.16±0.88 ^{ab}	4.96±0.96 ^c
Survival (%)	88.33±7.64 ^b	95.00±5.00 ^b	98.33±2.89 ^b	91.67±5.77 ^b	86.67±2.89 ^b	45.00±13.23 ^a

IW: Initial weight, FW: Final weight; IL: Initial length, FL: Final length. Values are mean ± standard deviation.

Mean values with different superscripts in the same row are significantly different (P<0.05)

Table 4 showed that average initial weight of *P. monodon* shrimps were 0.46-0.51 g, and similar among treatments (p>0.05). After 60 days of culture, the final weight (FW) of experimental shrimps varied in the range of 2.30- 6.44 g, in which larger weight of shrimps compared to those in the control were observed at feeding rates from 50% to 100% feed ration of the control while the co-culture without feeding showed the poorest growth. Additionally, growth rate of

shrimps in terms of weight gain (WG) and daily weight gain (DWG) and specific growth rate (SGR) followed the same pattern as observed for the final weight. Statistical analysis for FW, WG and DWG showed that the G+50%C treatment had the highest values and significant differences from the control and the G+100%C; G+25%C and G+0%C treatments while it was insignificant difference ($p>0.05$) from those in the G+75%C treatment. However, for specific growth rate (SGR) there were not statistical differences ($p>0.05$) among the G+100%C; G+75%C and G+50%C treatments.

Growth in length of shrimp followed similar trend as growth in weight. The final length of shrimps were in the ranges of 5.23-9.19 cm, in which the shortest length was in the G+0%C followed by the control, and highest values was found for the G+75%C and G+50%C treatments. There were significant differences ($p<0.05$) among the control and the G+75%C; G+50%C and G+0%C treatments.

These findings was similar to the study of Anh *et al.* (2014), growth rate of shrimp *L. vannamei* in co-culture with green seaweed fed 50% and 75% satiation were equal to or significantly higher than shrimp fed to satiation in mono-culture. Anh and Ngan (2017) also revealed that growth performance of shrimp (*P. monodon*) in co-cultured with sea grape (*Caulerpa lentillifera*) fed 50% or 75% *ad libitum* were considerably higher than those in the mono-culture fed *ad libitum*. Similarly, the study of Tsuisui *et al.* (2015) found that the enhancement of growth performance in co-culturing black tiger shrimp (*P. monodon*) with green seaweed (*Chaetomorpha* sp.). After 10 weeks of cultivation, the final mean weight of co-cultured shrimp was 50% higher than the mono-cultured one (control), and the SGR of shrimp in the integrated system ($4.79\% \text{ day}^{-1}$) was also obviously higher than the control ($4.14\% \text{ day}^{-1}$).

Izzati (2011) reported that co-culture tiger shrimp-*Gracilaria*, this seaweed was better in supporting the growth of shrimp because *Gracilaria* was the most efficient bio-filter, which was capable in reducing excess of nutrient resulting in better water quality and served as food source for shrimp. Additionally, *Gracilaria* sp. was found to be rich in essential amino acids such as valine, leucine, isoleucine, methionine, phenylalanin (Wen, *et al.*, 2006). According to FAO (2003); Hau and Dai (2010), *Gracilaria* species have high nutritional value; they contain high indispensable amino acids and fatty acids, pigmentation, antioxidant substance that is a good source of food for fish and shrimps.

In the current experiment, shrimp integrated *Gracilaria* and applied reduction of feed ration between 50% and 75% of satiation indicating shortage of feed for their requirement so these animals could ingest *Gracilaria* present in the culture tank as feed supplement for them. In this case, shrimps were lived in the good environment and good supplemental feed that favored growth of shrimps. However, when application of feed regimes at 25% amount of control feed or without supplying commercial feed to shrimp that caused considerably poorer growth performance, especially the treatment without feeding had both lowest survival and growth rate. It was noted that differences in nutritional composition between commercial feed and red seaweed *G. tenuistipitata* used in this study could be the reason for the observed differences in shrimp performance. The commercial feeds contain $\geq 42\%$ protein and 5-6% lipid, which are within recommended levels for the growth of *P. monodon* shrimp produced by manufacturer (Table 1). Previous studies reported that the range of 35-45% protein level in the diet produces the maximum weight gain of *P. monodon* shrimps. Wu (1986) also pointed out that 6% lipid level contained in the diet would bring about the best growth in *P. monodon*. In contrast, *G. tenuistipitata* used this study had lower protein (12.34%) and lipid contents (1.36%) (Table 1). This might be another cause of the poorest growth rate and reduced survival of shrimps consuming only this seaweed.

Shrimp survival

Survival of experimental shrimps after 60 days of culture was in the range of 45.00-98.33%, of which the co-culture of shrimp-*Gracilaria* without feeding had the lowest value and significant difference ($p<0.05$) compared to the remaining treatments. Furthermore, co-culture with feeding regimes from 25% to 100% feed ration of the control that improved shrimp survival but these treatments were not statistical difference ($p>0.05$) from the control- monoculture (Table 4). It indicated that reducing feeding rate up to 25% feed ration in the co-culture treatments did not considerably affect survival of shrimps. However, the co-culture of shrimp-*Gracilaria* without receiving commercial feed resulting in the lowest survival. It could explain that the phenomenon of conspecific cannibalism in the culture tanks was clearly observed at the later period of the experiment, when pieces of dead shrimps were observed in these culture tanks and most likely constitute shrimps that were eaten by the bigger ones during molting.

The current experiment was comparable to the study of Anh *et al.* (2014), who reported that the survival of shrimp in mono-culture and co-culture of *L. vannamei* with green seaweed (*Enteromorpha* and *Cladophoraceae*) combined with feed reduction up to 25% feed supply of the control was not significant difference, and obtained survival of 85-95%. However, Susilowati *et al.* (2011) reported that in polyculture of white leg shrimps (*L. vannamei*) and seaweeds (*G. verucosa*) helped increase in the survival of shrimp from 45.2% to 94.6%. Similar finding was found by Anh and Ngan (2017) who revealed that shrimps (*P. monodon*) co-cultured with sea grape (*C. lentillifera*) attained significantly higher survival (88.3-96.7%) compared to the control (78.3%). Furthermore, it was noted that the experimental shrimps in the present study were challenged with pathogenic bacteria, it was found that integrating red seaweed (*Gracilaria* sp.) with black tiger shrimp (*P. monodon*) could induce the immune response of haemocytes and improve the survival rate of shrimp with *Vibrio parahaemoticus*. After 14 days of artificial infection, the mortality of the shrimp in the co-culture treatments (23.3%) was much lower than the mono-culture one (63.3%) (Hoa *et al.*, 2016).

Biomass of red seaweed *Gracilaria tenuistipitata*

Variation of red seaweed *G. tenuistipitata* biomass in the co-culture treatments during 60 days of experiment was presented Figure 2. It was found that in the first week of culture, the weight of red seaweed slightly increased in all treatments (initial weight of 200 g and 209-216 g biomass at the first week), and then tended to decline during experimental period were seen in all reducing feeding treatments. The more reduction of feed rations the more of red seaweed biomass decrease *i.e.* at day 60, red seaweed biomass in the G+100%C treatment was 132 g and only 85 g seaweed was obtained in the co-culture without feeding treatment (G+0%C). In contrast, the co-culture treatment with 100% feeding regime of the control (G+100%C), biomass of red seaweed tended to increase during culture period (initial weight of 200 g and 315 g at day 60).

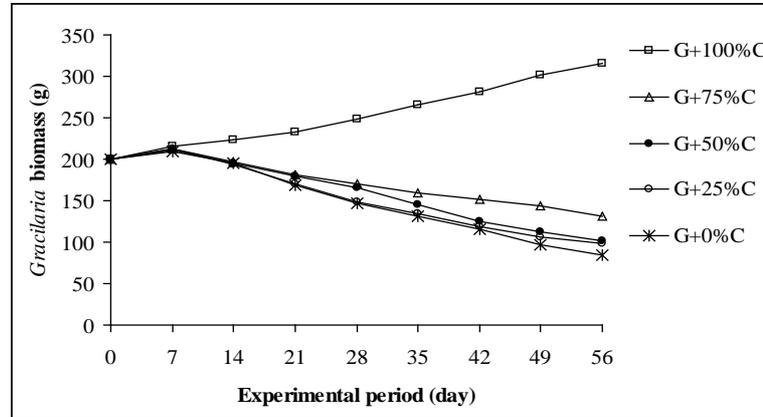


Figure 2 Biomass of red seaweed *Gracilaria tenuistipitata* during experiment

These results indicated that during the first week, the tiger shrimps have not consumed seaweed yet, and when the pellet feed was not supplied enough at later stage, shrimp might use the red seaweed available in the culture tanks to compensate for food shortage resulting in decreased in biomass for all co-culture treatments with reducing feed supply. For co-culture of shrimp-red seaweed fed to satiation, they might not need extra food so in this case red seaweed only served as bio-filter, absorbed nutrient (N and P compounds) released from shrimps and dissolved substances from the pellet feed for their growth and development as a consequence biomass of red seaweed increased. Similar result was found by the study of Anh *et al.* (2014), biomass of green seaweed in co-culture decreased with reduction of feed ration from 25% to 75% satiation during culture period.

Shrimp production, feed conversion ratio (FCR) and feed cost

Table 5 Production of shrimp, FCR and commercial feed (CF) cost after 60 days of culture

Treatment	Shrimp production (g m ⁻³)	FCR	CF cost for shrimp growth (USD kg ⁻¹)	Reduction ratio of CF compared to control treatment (%)
Control	730.5±36.9 ^b	1.46±0.12 ^c	2.37±0.20	-
G+100%C	883.6±44.9 ^c	1.25±0.09 ^c	2.04±0.14	-14.19±6.05
G+75%C	987.6±48.1 ^c	0.87±0.08 ^b	1.41±0.13	-40.41±5.70
G+50%C	983.3±58.1 ^c	0.54±0.02 ^a	0.88±0.03	-62.96±1.38
G+25%C	609.9±30.7 ^b	0.44±0.02 ^a	0.71±0.03	-69.94±1.23
G+0%C	173.5±55.2 ^a	-	-	-

Commercial feed price: 1.63 USD kg⁻¹

Mean values with different superscripts in the same column are significantly different (p<0.05)

After 60 days of culture, shrimp production in the G+100%C, G+75%C and G+50%C treatments were similar (883.6-987.6 g m⁻³), and significantly higher (p<0.05) than those in the control (730.5 g m⁻³) and the G+25%C (609.9 g m⁻³) and the G+0%C treatments (172.5 g m⁻³).

Feed conversion ratio (FCR) of pellet feed was 0.44-1.46 of which the highest FCR was observed in the control and progressively reduced with decreasing feed ration supplied to the culture tanks. Statistical analysis indicated that the control treatment had significantly higher value (p<0,05) than other treatments, except the G+100%C treatment which was provided the same feed ration as the control. Furthermore, the G+25%C treatment was lowest but it not statistical difference (p>0.05) from the G+50%C treatment (Table 5).

The commercial feed cost for 1 kg of weight gain of shrimp has the same pattern as FCR, the highest cost (2.37 USD kg⁻¹) was found in the control and steadily declined with reduction of feeding rate provided to the culture tanks and the lowest

feed cost was seen in the G+25%C treatment (0.71 USD kg⁻¹). Besides, when applying co-culture of shrimp-red seaweed with 100% feed ration of the control, the feed cost reduced only small proportion (14.19%). When co-culture system combined with feed reduction from 75% to 25% feed ration of the control, the feed cost could be reduced from 40.41% to 69.94% (Table 5). Especially, reduction of feed cost in the G+50%C treatment was 62.96% and growth rate and survival as well as production of shrimps in this treatment were considerably higher than those in the control. This reduction level could be considered the optimal feeding ration in co-culture of black tiger shrimp-red seaweed *G. tenuistipitata*.

The present results are in accordance with the study of Susilowati *et al.* (2011), who found that in polyculture of shrimps (*L. vannamei*) and red seaweeds (*G. verucosa*) helped increase in the survival of shrimp from 45.2% to 94.6%, the absolute growth had a weight increased from 9.57 g to 12.97 g, the specific growth rates increased from 4.75% to 5.07%, and biomass productions also increased from 181.56 g m⁻² to 883.95 g/m². Similar findings reported by Anh (2014), co-culture of shrimp-green seaweed, shrimp yield increased at 50% and 75% feed ration of the control while FCR tended to decrease with reduction of feeding rate compared to the control fed *ad libitum*, and helped to reduce up to 50% feed supply. Anh and Ngan (2017) also found that growth performance and yield of *P. monodon* in co-cultured fed 50 or 75% satiation were significantly higher than those in the control as well as feed cost could be reduced from 44.1% to 71.8%. Another study from Tsuisui *et al.* (2015) revealed that the enhancement of growth performance and FCR in co-culturing black tiger shrimp (*P. monodon*) with green seaweed (*Chaetomorpha* sp.). After 10 weeks of cultivation, the final mean weight of co-cultured shrimp was 50% higher than the mono-cultured one. The SGR in integrated shrimp (4.79±0.08% day⁻¹) also obviously higher than the control (4.14±0.27% day⁻¹). In addition, FCR in co-cultured tanks was 38.9% lower than the mono-culture tanks.

Proximate composition of fresh shrimp meat after 60 days of culture

Table 6 showed that the texture of fresh shrimp meat were high (138.7-182.8 g*cm) in the co-culture combined with different feeding regimes while these values were lower in the control (92.7 g*cm) and the G+0%C treatment and they significantly differed from the remaining treatments.

Table 6 Proximate composition of fresh shrimp meat (% wet weight)

Treatments	Texture (g*cm)	Moisture	Protein	Lipid	Ash
Control	92.7±19.2 ^a	78.5±0.5 ^b	14.48±0.38 ^{bc}	0.83±0.05 ^b	1.41±0.08 ^{ab}
G+100%C	138.7±38.4 ^b	78.7±0.4 ^b	15.68±0.23 ^c	0.70±0.06 ^{ab}	1.52±0.16 ^{ab}
G+75%C	182.8±32.6 ^b	79.0±0.3 ^b	15.21±0.47 ^{bc}	0.72±0.05 ^{ab}	1.63±0.12 ^{ab}
G+50%C	156.8±34.4 ^b	79.1±0.7 ^b	15.20±0.34 ^{bc}	0.73±0.04 ^{ab}	1.83±0.13 ^b
G+25%C	149.6±24.8 ^b	79.6±0.5 ^b	14.02±0.13 ^{ab}	0.71±0.04 ^{ab}	1.50±0.11 ^{ab}
G+0%C	57.6±6.7 ^a	84.3±0.4 ^a	13.11±0.34 ^a	0.62±0.05 ^a	1.32±0.06 ^a

Values are mean ± standard deviation.

Mean values with different superscripts in the same column are significantly different ($P < 0.05$)

The moisture content of shrimp meat in the co-culture without feeding (84.3%) was considerably higher than the control (78.5%) and other treatments (78.7-79.6%). The protein contents in the G+100%C; G+75%C and G+50%C were higher compared to the control but not significant differences ($p > 0.05$) among these treatments, and the G+0%C treatment had a lowest value and significantly differed from the other treatments. The lipid content of shrimp meat in the control treatment was highest (0.83%), and significantly different ($p < 0.05$) from those in the G+0%C (0.62%) but not significant difference ($p > 0.05$) with other treatments. The level of ash was in the range of 1.32-1.83%, of which the G+50%C treatment was significantly higher than the G+0%C treatment (Table 6).

Proximate composition of shrimp meat in the current study was comparable to the results of Kasuppasamy *et al.* (2014), who reported that the black tiger shrimp contained 11.41 mg g⁻¹ of protein, 1.06 mg g⁻¹ of lipid and 80.89% of moisture. Ash content was also compared to the result in the study of Nguyen Tien Luc (2014), who reported that there was 1.98% of ash in the proximate composition of black tiger shrimp.

Color of boiled shrimps

Figure 3 showed that the boiled shrimps had red coloration was markedly darker in the co-culture than in the mono-culture. Comparing among co-culture treatments, the G+ 0%C treatment had darkest orange red color followed by the G+75%C. The color of shrimp after cooking in the G+100%C, G+50%C and G+25%C treatments showed no clear differences among treatments.



Figure 3 Color of the experimental shrimps after boiling at 100°C in 5 minutes

Yu *et al.* (2003) stated that pale red color was observed in intensive shrimp culture that caused by the lack of astaxanthin. Norziah, and Ching (2000) found that red seaweed (*Gracilaria changgi*) contained high amount of β -carotene and other pigmentation. According to Chanda *et al.* (2010), seaweed contained a lot of antioxidant molecules, such as ascorbate and glutathione (GSH) when fresh, as well as secondary metabolites, including carotenoids (α - and β -carotene, fucoxanthin, astaxanthin) which was very helpful to build the high pigmentation for shrimp. Report of Lorenz (1998) stated that red seaweeds contained high concentration of astaxanthin which would explain the high pigmentation of the black tiger shrimp in the integrated treatments with *Gracilaria*. There was an agreement with the study of Anh *et al.* (2014), when integrating shrimp with *Enteromorpha* sp. and Cladophoraceae, shrimps had darker red colour than those in the mono-culture treatments. Similarly, according to information from AQUA Culture Asia Pacific (2007), the tiger shrimp was much healthier and greater growth performance in the extensive ponds with seaweed presence. Shrimps in those ponds had higher pigmentation, better texture, and good flavor compared to those cultured in the intensive farming system.

In summary, co-culture of the black tiger shrimp (*P. monodon*)-red seaweed (*Gracilaria tenuistipitata*) and applied feeding rate from 50% to 75% satiation that improved water quality, survival, growth, feed efficiency and quality of shrimp compared to those in the monoculture.

Future research is needed to apply the best result of the present study in field conditions in order to demonstrate the practical approach and financial efficiency for further development of co-culture system shrimp-red seaweed in Vietnam and other countries.

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AUTHORS

First Author – Nguyen Thi Ngoc Anh, College of Aquaculture and Fisheries, Can Tho University, Can Tho city, Vietnam. Email: ntnanh@ctu.edu.vn

Second Author – Luong Thi Hong Ngan, Bachelor student, College of Aquaculture and Fisheries, Can Tho University, Can Tho city, Vietnam. Email: hongngan8594@gmail.com

Third Author – Nguyen Hoang Vinh, PhD student, College of Aquaculture and Fisheries, Can Tho University, Can Tho city, Vietnam. Email: vinhknbl@gmail.com

Fourth Author – Tran Ngoc Hai, College of Aquaculture and Fisheries, Can Tho University, Can Tho city, Vietnam. Email: tnhai@ctu.edu.vn.

Correspondence Author – Nguyen Thi Ngoc Anh, College of Aquaculture and Fisheries, Can Tho University, Can Tho city, Vietnam. Email: ntnanh@ctu.edu.vn, Contact No.: +84-292-3834307

Exploring Teaching Practices That are Helpful in Addressing at-risk Students in Classroom

Ahmad Zahir Wali*, Mohammad Naeem Saad**

* Department of English Language and Literature, Kandahar University

** Department of English Language and Literature, Nangarhar University

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Abstract- This study is conducted to explore and identify factors that put students at risk. Secondly, it introduces teaching practices that are found to be helpful in dealing with those students who are entitled at-risk. The data for the study has been collected through a critical review of available literature. The findings indicate that different factors related to school, personal life, family and community contribute in putting students at-risk. The findings also show that caring and committed teaching, involvement in learning, peer tutoring, tutoring and small groups are the beneficial teaching practices for students at-risk.

Index Terms- contributing factors, teaching practices, Students at-risk

I. INTRODUCTION

There is a large body of students at schools around the world who are titled to be at-risk. In the education field, it is important to find ways that would be effective in dealing with these students. Thus this literature is a small step for the doing something important for the students. This paper has identified teaching practices that would prove helpful for teachers to bring back the students to the right track of learning performance and has also identified factors that contribute in putting students at risk.

Research Objectives

1. To identify the factors that contribute in putting students at-risk.
2. To identify teaching practices that are helpful in dealing with students at-risk.

Definition of "at-risk" students?

Moore (2006) believes that at-risk term can be widely used for referring to the problems an individual face such as school failure, death, dependency in terms of economy and etc., but at-risk in the context of school refers to students who are experiencing no success in terms of grades. Calabrese, Hummel and Martin (2007) similarly define at-risk students as those who are not able to perform well in the mandatory assessments and overall school achievement. Moreover, Manning and Baruth (1995) define students at-risk as those who are not able to graduate from high school due to several risk factors that include poor achievement, grade retention, bad attendance, problems of

attitude and school attendance where large body of the students are poor. Similarly Thompkins & Deloney; DeYoung et al (as cited by Khattri, Riley & Kane, 1997) explains at-risk students as those who fail a course, drop out of school or who don't take challenging courses.

II. FACTORS THAT CONTRIBUTE IN PUTTING STUDENTS AT RISK

According to Hammond, Linton, Smink and Drew (2007) studies have found different factors that put students at-risk and these factors are categorized in four domains: Individual, school, factors related to community and family. The individual domain factors are those that are related to students individually such as high-risk demographic characteristics, responsibilities of early age (excessive work hours, being a parent), attitudes and behaviors of high-risk, low or no progress at school, no engagement in school (poor attendance, lack of effort, no school commitment) and education stability. The family domain factors relate to the background of the family such as family background characteristics (poor socioeconomic status, mobility of family, uneducated parents, many siblings, family problems, not living with natural parents), stress level at family, attitude and perception toward education, and family dynamics. The school domain are factors that relate to the environment, structure and policies of the school such as resources of school, the characteristics of students as a whole, students' performance, school atmosphere, academic rules and policies and supervision and discipline rules and regulations. The community domain factors are relevant to the societies and its surroundings such as type and location of the society, characteristics to the demography of the society, and the overall environment. All these factors contribute to entitling a student to be at-risk and the combination of more than one risk factors result in less motivation of the student and eventually increases the chances of putting the student at high risk for dropping the school (Suh & Suh 2007).

Finn & Rock (1997) argues that the notion of at-risk is related to the fact that if an individual is exposed to a condition involving risk factors, it is inevitable that the individuals will experience unwanted consequences. The common risk factors with regard to academic outcome are characteristics of group status related to academic failure or school drop outs such as a minority group related student attending a more populated city school, students

from low-income families or living where English is not spoken as a primary language. Finn and Rock further describe that the risk factors usually give birth to risk behaviors too that hinder the learning of the individuals and resulting in not going to school, not attending classes, not meeting the teacher and ignoring to do class activity or homework. Finn (1989) goes deep into finding out the causes of students failure or school drop outs by presenting two models to explain the drop out as a process that is developmental and that may start in the early school grades: First, The frustration-self-esteem model that recognizes failure of school as the starting point in the form of either the student's rejecting of school or school rejection of the student. In this model, poor performance in the school in the form of low scores on standard or teacher made tests or a history of low scores lead to poor self-view. A poor self-view is the result of frustration and embarrassment from poor school performance. Consequently, the impaired self-view may give birth to opposing behavior in the form of not attending classes, disrupting the instruction process or even commitment of offending behaviors. Second, participation-identification model that concentrates on the student's behavioral and emotional engagement and involvement in school. Moreover, students who are successful tend to have the feelings of commitment or affiliation with school while those who are tending to be at-risk students don't develop the identification sense with school. The model further describes that

III. TEACHING PRACTICES THAT HELP STUDENTS AT-RISK

This part explores teaching practices that are found to be helpful in addressing at-risk students in the class.

3.1. *Caring and committed Teacher*

Good and Brophy (1997) stated that the academic success of students is strongly related to what the teachers expect from the students. This proposition is also supported by Muller (2001) stating that what teachers do and what attitudes they show in the form of expectations from students, greatly relates to the academic success of students. Alderman (1990) also accept the fact that teacher's expectations greatly influence the academic performance of at-risk students and he identifies the teacher expectations as the feelings given to students that teachers are really looking forward to their success and that the objectives will be achieved by them and the assurance that expertise needed for them to achieve teachers' expectations will be taught to them. McCrosky (as cited by Teven & McCroskey, 1997) asserted that It is always wonderful to have teachers care about their students, however it is difficult for teachers to care for every single student in larger classes. Thus, it crucial for instructors to communicate with students in a way that students should be given the perception that they are cared for by the teacher even if the caring phenomenon is not true in reality. The fact that providing the feelings to the students that a teacher really care is more important than caring for students in reality.

Knesting (2008) insists that caring and commitment of a teacher is more helpful to at-risk students in their persistence to avoid school drop-out compared to the counseling and academic programs designed to prevent the drop-outs of at-risk students. The perception of teachers who tended to understand the attitude of students, the belief by teachers that these students have the potential to succeed and acceptance of students despite the fact of

students have to experience identification with school that is feeling the attribute of belonging and valuing and this would result in students' participation in school activities and eventually successful performance outcomes will be experienced in students. In this cycle, quality instruction also has important impact on the students' engagement in school activities and positive performance outcome. However, based on this model if students fail to develop the sense of identification with school or are not able to engage in school activities, there are greater chances that students would be labeled as at-risk or may drop out of school. Moreover, Suh and Suh (2007) found three risk factors that greatly contributed in putting the students at risk and made students on making the decision to drop out of school. The risk factors include failure in academic environment, low socioeconomic status and behavioral problems. The study results also proposed that teachers and parents should be collaboratively involved in consultation activities by school counselors so that the students who show risk factors can be identified.

On the contrary numerous researchers put forward the factor of low school engagement during the education period of students as the main reason making students to be at risk and to drop out of school. The more students at-risk are engaged with school related activities and perceive the feelings of belonging to school, the less their chances are to be at-risk to drop out (Caraway, Tucker, Reinke, & Hall, 2003)

being at-risk are factors that proved to be helpful in making at-risk students stay at school and ignore the drop out decision. Knesting further explained that at-risk students tend to consider school drop-out due to the fact that they perceive their selves as unwanted or someone that does not matter at all, however he argues that teachers' role plays a very important part to insure the students that they matter and efforts by the teachers should be made to create classrooms where the at-risk students are provided with the opportunity of belonging. Knesting also described that the belief of teachers that all students have the potential to succeed who are dealing with at-risk students is of equal importance in helping them with their persistence in school. This belief motivates them to show progress. By ignoring their weaknesses, teachers insure students that they are equally respected just as all other students and this will lead to providing an atmosphere of acceptance and support where students would find it very easy to stick to the class and possibly show progress. Meanwhile McCrosky (as cited by Teven & McCroskey, 1997) presented three factors (Empathy, understanding, responsiveness) that will likely make a student believe that his/her teacher is caring for her/him. First, teachers have to show empathy for their students, that is giving the feelings to the students that the teacher understand their situation and behave toward students in a positive manner. Second, teachers' ability to understand students' feelings, ideas and needs. Teachers who are able to understand the situations where students feel troubled in terms of their course subjects or for personal reasons, they are considered caring teachers. Lastly, teachers who tend to respond to students' needs and problems rapidly or when the students are given the attention by teachers, students' perceive them as caring teachers.

3.2. Involvement in learning:

The main factor that influences students' decision to drop out of school is their disengagement in the learning process of school, the more they are provided the opportunities to engage in school activities and learning, the less are their chances of school dropout (Caraway, Tucker, Reinke, & Hall, 2003). Literature reveals that engaging the at-risk students with learning greatly decreases the chances of school dropout. Lehr and Harris (1988) presented instructional processes that is found to be effective in engaging at-risk students in learning process. They believe that the information should be presented to low achievers of the class in different ways by the teachers so that the students can have the information processed at their pace. Teachers have to look for ways to engage at-risk students to the possible extent, because the more classroom activities engage the students, the more it would be helpful for them to process information in fruitful ways to become independent learners. Lehr and Harris further explain that involvement of at-risk students in leaning starts with finding ways to get them started in the first place. Literature revealed that slow learners take longer to get started compared to those who are fast learners. In order to have low achiever students to get started, teachers have to help them learn on how to learn. In other words, if a task is being given to students, the teacher has to be more helpful to at-risk students to explain what he/she expects them to do and even demonstrates it through an example to motivate them to get started. Lehr and Harris presented different ways that can be used to engage at-risk students in learning. They propose that teachers have to teach needed study skills that would enable low achievers get started with the tasks they are supposed to do. These skills include, explaining the task to students in more details and with illustrative models, providing a checklist of assignments to these students, employing an attention getter in the beginning of each lesson, providing peer assessment when students need and letting them choose a peer, careful observation of seatwork, having students use help cards when assistance is required while doing classwork and etc.

3.3. Peer tutoring

Peer tutoring is an instructional process in which learning happens in between students by teaching each other (Goodlad & Hirst, 1989). Extensive research findings indicate that peer-tutoring is a very effective way of addressing the needs of at-risk students or low performing students especially in helping them in learning basic skills. As in peer tutoring, students are learning from each other, it is important that peer students are clearly provided instructions about their peer tutoring roles and in order to insure the effectiveness of peer tutoring practice, the peers should be closely monitored. Teachers should make sure that peer tutoring activity is highly organized and structured so that it is effective in helping at-risk students to learn better (Snow & Barley, 2005). Meanwhile, Beasley (1997) also considers peer tutoring as a cost effective way of letting learner's get academic support from another learner in an effective way. He further claims that students benefit from this activity by improving their understanding and proficiency in their relevant subject matter, improving their confidence and study expertise, and establishing fruitful friendships. Within peer tutoring activities, both the tutor and tutee benefit in enhancing their learning and skills. In the findings of a study by Comfort and McMahon (2014), it was

revealed that peer tutoring is an influential method that fosters the academic success of students and the data results of the study indicated that students with peer tutor sessions had achieved higher grades than those who did not experience it. The findings also demonstrated that peer tutoring improves both academic experience and achievement of learners. Gaustad (1992) pointed out that despite the fact that peers don't have as much content knowledge as teachers have it, still there are some cognitive and social advantages of peer tutoring to the peers. Peer tutors and tutees are cognitively so closer that makes it easy for the peer tutors to understand the problems of tutees. Allen and Feldman (as cited by Gaustad, 1992) the nonverbal behavior to determine the understanding of lessons by peers was accurately interpreted by third and six graders compared to experienced teachers.

3.4. Tutoring

Extensive literature evidence prove that tutoring is a brilliant way of addressing the needs of students who are at-risk or are performing poor and it is important that each tutoring session is implemented based on a clear purpose of guidance so that tutors can take decisions accordingly (Snow & Barley, 2005). In 1991, many different intervention programs designed to stop school drop-outs or academic failure were reviewed by Robert E. Slavin and his co-workers at research center for effective schooling of disadvantaged students (CDS). The findings indicated that all kinds of tutoring are far more beneficial and influential compared to other alternatives and the best of all tutoring kinds is one to one tutoring that is done by skilled instructors (Gaustad, 1992). Gaustad (1992) presents two factors that make tutoring the most powerful way in helping students with their learning. First, tutoring is beneficial due to its cognitive individual instruction. This means that in tutoring the instruction can be entirely modified in terms of pace, style of learning and difficulty level of the learner. In case the learner is noticed to express signs of not understanding, the tutor can come up with some changes so that the learner can follow and understand what is supposed to be understood or learned. In this individualistic instruction, misunderstandings are rapidly tackled, quick feedback and correction is provided, the practice for the learner is provided according to the perceived need of the learner and level of difficulty from easy to hard is decided upon the learner's progress. Secondly, tutoring is emotionally beneficial in one-to-one relationship. The emotional advantages of tutoring is greatly of benefit to students at-risk. Because tuition is one-to-one learning process, the absence of competition between others help at-risk students be motivated and by receiving admiration for the progress made without being neglected due to the comparison with other rapid learners. Also, the learners by seeing the evidence of the progress, feels more self-confident and tend to be more engaged in the subject matter.

3.5. Small groups

Newsome (2004) pointed out that numerous approaches such as incentive programs, after school enrichment activities, tutoring programs, individual consoling, talking to parents actively have been practiced to address those students who are at-risk and low achievers. Recently researchers have proposed school based group intervention in the form of solution-focused brief therapy (SFBT). Group work provide the opportunity of letting students

help each other mutually and is a great platform for shared learning. Additionally, it is an efficient way to use services provided by school practitioners that are of high demand on their time. Group work in the form of (SFBT) has showed positive impact on fostering the self-esteem and academic achievement of individuals who are titled as at-risk students due to the various risk factors they have been facing. Snow and Barley (2005) also suggest group work as an effective model for at-risk students and further believe that students at-risk and low achievers can greatly improve within groups that have been comprised from mixed ability students with the belief that the group members should be working together following the basic concept of cooperative learning. However, in order for the mixed ability group to have desired results, it is important to make sure that the teacher has quality training, the activity for the group is prepared beforehand and the activity is facilitated within group. Lehr and Harris (1988) presented a technique called Kindling that can be used to increase the involvement of at-risk students through the process of kindling. The five step kindling process is used as a group activity to motivate and involve at-risk student with learning process. First, teacher presents a questions and the students write a response for it individually. The students each share their answers with their partners and if possible, they can expand their response further. Later on, the question is discussed in a small group and each individual shares his/her ideas and as a group the response to the question is expanded. Finally the group can discuss further because the idea is kindled and at-risk students within the group were engaged in the activity. Bauer, Sapp and Johnson (1999) also believe that Counseling group is an effective way to bring out the at-risk students out of the failing cycle they often go through and group counselling is a perceived as a good way of letting members of the group experience and learn skills and behaviors that are new and practice them as it would help students at-risk to be successful in school.

IV. PREVIOUS STUDIES

A study conducted by Calabrese, Hummel & San (2007) to investigate positive experiences of teachers and administrators related to students at risk at Centerville High School and Centerville Middle School of Centerville area of Midwestern America. The study was conducted based on qualitative embedded case study and data was collected using focus group, semi-structured interview and an online survey as data instrument. The findings of the study indicated many teachers believed that they viewed themselves as difference makers in dealing with students at-risk and these teachers believed that by building rapport with their at risk students, they experienced positive change in the lives of the at risk students. The rapport building between these students and teachers happened outside the setting of classroom on frequent bases. The findings further illustrated that with the belief that the at-risk students have the potential to succeed, teachers and administrators were able to experience change in them. The results additionally indicated that teachers have experienced positive core of experiences by communicating with the parents of at-risk students through technology and this communication provided the opportunity to the teachers to work with the at-risk students in the best of their interest. Lastly, the findings proposed that many of the teachers

agreed that it makes a difference in the lives of at-risk students when teachers give them the feeling that they care for them and they are wanted and loved.

Another study undertaken by Laskey and Hetzel (2011) was aimed to study the factors that impact the retention and GPA of students in a college based program designed for students at-risk. The study was undertaken in a private university located in Midwest. The study sample included 115 at-risk students registered in a Conditional Acceptance program (CAP). Data for the study was collected in the period of three years length of the CAP program and students' records were used to extract data for the study. The findings of the study pointed out that the retention and GPA of at-risk students is greatly influenced by tutoring. The results further explained that tutoring presents the contents of the class in a different context and in more clarified way to at-risk students. Additionally the results proposed that tutoring is not only an effective way to help at-risk students academically, but it can also be used as a means of establishing relationship between at-risk student and tutor.

This study was intended to examine whether the school engagement has influence over the students' achievement. Two studies were conducted for studying the relationship of engagement with achievement and a nationwide sample of 8th grade students survey of the U.S. Department of Education's NELS:88 was used. The measures of participation was generated student, parents and teacher questionnaires for both studies. The participation measures included students' attendance, classroom engagement and participation in school related activities apart of their regular studies. Three main findings were found from both studies: first, risk factors that relates to behavior have relationship with school outcomes in a significant way even within racial/ethnic, socioeconomic or language groups. It was found that behavior of engagement can be corrected more compared to traditional indicators of status, thus educators and researchers should focus more on behavioral engagement amendment. Secondly, the findings indicated that risk behaviors emerge in the period of early school years or even earlier and it should be recognized in the early stage possible. The early identification of risk behaviors and tackling it at its earliest will improve students' engagement in the primary school. Lastly, the results stated that achievement of students should be recognized even if it is not very significant compared to the successful students, so that the students are motivated to retain their school involvement (Finn, 1993).

V. CONCLUSION

There are wide range of factors that put students at-risk which most of the time result in school drop-out or the inability of students to graduate from school on time. It is quite difficult to control factors of risk surrounding an individual, however different teaching approaches and methods can be used that would help students at-risk to be engaged in learning and show progress even if it is minor. This paper presented some of the teaching approaches that have been found to be very effective in addressing students who are entitled to be at-risk.

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AUTHORS

First Author – Ahmad Zahir Wali, M.Ed, Kandahar University, zahirwali@gmail.com.

Second Author – Mohammad Naeem Saad, M.Ed, Nangarhar University, mnaeemsaad@yahoo.com

Correspondence Author – Ahmad Zahir Wali, zahirwali@gmail.com, +93700329899.

Awareness and Knowledge of Health Workers towards Professional Team Work in Hospitals in Northern Senatorial District of Cross River State, Nigeria

Adie, J. A.; Beshel, I. A. and Abua, P. U.

Department of Health Information Management, Cross River State College of Health Technology, P. M. B. 1324, Calabar, Nigeria

*Corresponding author: akunkeadie@yahoo.com; Tel. (+234-8030851492)

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ABSTRACT

This study examined Awareness and knowledge of health workers towards professional team work in hospitals in Northern senatorial district of Cross River State, Nigeria. To achieve the objective of the study, three specific objectives were developed from which three research questions were stream - line for the study. The study adopted a social survey research design and a questionnaire was used to gather information. A sample of 250 health professionals were randomly drawn from three hospitals from the area for the study. A structured questionnaire was used to obtain the opinion of the health workers and percentage was used to analyse the data. The result of the findings revealed that there was awareness and knowledge of professional team work among health workers; team work create impact among health workers; and attitude of health workers towards team work have significant impact on patients' care. The study concluded that professional team work in hospitals is inevitable. Management should endeavour to continuously and regularly create awareness on professional team work among health workers through workshops/ seminars and curricula on team work should be incorporated into the various health care training programmes.

Key words: Awareness, knowledge, Health workers, professional, team work

INTRODUCTION

Professional team work in the hospital is an important factor in health services provision to patients. Professional teamwork in the hospital is when the health professionals collectively work and interact interdependently to provide effective care to the patients. It is the practice that deal with collaboration and improvement of communication to expand the traditional roles of health professionals and to make decisions as a unit that works towards a common goal. Thus, "TEAM" can be explain as "Together Everyone Achieve More", which specifically refer to the number of professionals/people working together collaboratively to achieve a common goal or task".

Professional team work can be functional when there is a clear purpose and implementation protocols, procedures, effective communication forum and discussions are held to sort out or share information relating to patients' problems and to improve performance. Professional team work is necessary and effective in Health care delivering, because it can immediately and positively affect patient safety and outcome. The need for effective team work is increasing due to increase in morbidities and complexity of specialization of care (David; Day and Eduardo, 2006). Besides the complex and complicated nature of the health services couple with the increase of chronic diseases like diabetes, cancer and heart diseases have forced professionals to take multidisciplinary approach to health care. The benefits of professional team work in health industry are enormous; it reduces cost of certain operation procedures, optimize scarce resources, minimize resources, services are provided to meet the needs of patients and income is generated to meet the set target. It reduces the issue of one staff / worker being responsible for the patients' whole problem. Professional team worker create a forum where all members working within the system with different background and experience come together to make meaningful contributions to resolve patient's problems (Fernandez, 2012).

STATEMENT OF THE PROBLEM

The problem of unequal distribution of talents couple with the complexity of the health care system has made professional team work approach to be inevitable. This has given room for unequal participation, thus, resulting in some of the health workers to sit back and letting others to do most of the work, which has the tendency of causing resentment in the

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workplace. Lack of team player in some cases often cause some workers to function alone on their own to accomplish a task. By so doing, the process limits creativity in teams of thinking and problem – solving. These consequently caused some of the workers to get burnt out and the patient left without the necessary care. This study is therefore envisage to ascertain the awareness and knowledge of health workers towards professional team work in government hospitals in Northern part of Cross River State, Nigeria.

OBJECTIVE OF THE STUDY

The main objective of this study is to investigate awareness and knowledge of health workers towards professional team work in hospitals in Northern senatorial district of Cross River State, Nigeria. The specific objectives were:

- i. To ascertain whether health workers in hospitals in Northern senatorial district, Cross River State, Nigeria are aware and have knowledge about professional team work.
- ii. To examine whether professional team work enhances the productivity of health workers in hospitals in Northern senatorial district of Cross River State, Nigeria.
- iii. To evaluate the impact of professional team work in patients' care in hospitals in Northern senatorial district of Cross River State, Nigeria.
- iv.

RESEARCH QUESTIONS

The following research questions were framed for the purpose of the study:

- i. Does health workers in hospitals in Northern senatorial district, Cross River State, Nigeria have knowledge and are aware of professional team work?
- ii. To what extend does professional team work significantly enhance the productivity of health workers in hospitals in Northern senatorial district Cross River State, Nigeria?
- iii. How does professional team work impact on patients' care in hospitals in Northern senatorial district of Cross River State, Nigeria.

LITERATURE REVIEW

The concept of professional team work is an important fact in providing high quality health care to patients. World Health Organization (2010) describe a professional as a member of a profession or vocation who is governed by codes of ethics and profess commitment to competence, integrity, morality, altruism, and the promotion of the public good within their expert domain. Professionals are accountable to those served and to the society. The healthcare industry is made up of multidisciplinary group of professionals, all contributing to the care of the patient. A team in the other hand is a group of persons who make different contributions towards the achievement of a common goal. It involves participatory planning, decision making, problem solving, openness in intra team relationships and avoidance of unnecessary duplication of work. Effective teams are a pre-requisite for achieving sustainable results (Kartikeyan and Chaturvedi, 2009).

Paul and Peterson (2001) defined team work as a distinguishable set of two or more people who interact dynamically, interdependently and adaptively towards a common and valued goal, objective or mission, who have also been assigned specific roles or functions to perform and who have a limited lifespan of membership. Adindu and Asuquo (2013) succinctly describe professional team work as a joint action by a group of professionals in which each person subordinates his or her individual interest and opinions to the unity and efficiency of the group. They further said that professional team work connotes the working together in unison towards the achievement of an agreed goal by a group of professionals. In team work, members of the group have the responsibility to plan or set objectives, formulate policies and monitor the implementation of necessary strategies to achieve the set objectives and take collective decision.

Professional teamwork is defined by Scarnati (2001) in Tarricone and Luca (2002) "as a cooperative process that allows professionals to achieve extraordinary results". Harris & Erhabor and Adias (2014) also asserted that a team has a common goal or purpose where team members can develop effective, mutual relationships to achieve team goals. Teamwork implies individuals working together in a cooperative environment to achieve common team goals through sharing knowledge and skills.

Professional teamwork is very essential in the delivery of health care services to patients. Physicians, nurses, pharmacists, technicians, and other health professionals must coordinate their activities to deliver safe and efficient patient care. Health workers provide interdependent services (e.g., a surgeon operate a patient, the anesthesiologist gives the anesthesia, the nurses provide the medication, and others functioning in specific roles and share the common goal of safe care. Considering the interdisciplinary nature of the work and the necessity of cooperation among the professionals who execute it, professional teamwork is necessary for the purpose of patient safety. When health professionals work as a Team, there is tendency for members of the team to make fewer mistakes than do individuals, especially when each team member is conscious of his or her responsibilities, as well as those of other team members (Smith-Jentsch, Salas and Baker, 1996).

Aye (2013) asserted that professional teamwork is the interaction or relationship of two or more health professionals who work interdependently to provide care for patients. He said that professional teamwork implies that members of the health team: Are mutually dependent; See themselves as working collaboratively for patient-centred care; have respect for each other; benefit from working collaboratively to provide patient care; share information which may lead to shared decision-making; and know when teamwork should be used to optimize patient-centred care.

Aye further stressed that professional teamwork is an indispensable ingredient of success whenever and wherever people have to come together to achieve goals because on their own, either they would be unable to achieve those goals at all or achieve them only sub-optimally. He further maintained that, in the health profession where there are various forms of collaboration and interdependence are mandatorily required to achieve certain health outcomes, professional team work is the basic essential requirement for success. Better teamwork among health professionals in Nigeria will reduce negative health outcomes for patients, improve the system of care and deliver efficient and effective health services to clients or patients.

MATERIALS AND METHODS

Northern senatorial district of Cross River State consist of five (5) local governments (Yala, Ogoja, Bekwara, Obudu and Obanlikwu) and has a projected population of 1,015,300 as at 2016. The area has eight (8) secondary health facilities (five are owned by government and three by the mission). Besides, there are private clinics and primary health centres that provide health services to the public too. The study population included Doctors, Nurses, Pharmacists, Health information staff and other paramedical health professionals in the hospitals. The consent of the affected staff was sought before the commencement of the study.

A sample of three (3) government secondary health facilities namely; General Hospital Obanlikwu, General Hospital Obudu, and General Hospital Ogoja were used for the study. Two hundred and fifty (250) health workers were contacted and informed about the study. A twenty – three (23) item questionnaire was designed and two hundred and fifty (250) copies printed and distributed to the staff from the sampled hospitals for completion. The questionnaire was in four parts: the first part seek the socio demographic characteristics of the respondents; the second explored teamwork awareness and knowledge among health professionals; the third explored the respondents' team work relationship in the hospitals; and the fourth addressed their perceptions of and attitude toward team work in the hospital.

The completed questionnaire were collected back without any being destroyed, thus representing 100% success. Data were extracted from the questionnaire and percentage was used to analyze the research questions to have a true picture of the respondents' views on the research problem. A discussion was carried out on the findings to establish the relationship between the variables under investigation.

SOCIO DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

A total of 250 questionnaire were distributed to respondents from the three (3) health facilities for completion and the same number (250) were returned, representing a response rate of 100%. The socio – demographic characteristics of the respondents is presented below in table 1.

Table 1. Demographic characteristics of the respondents

Age of respondents

Age (years)	NO. of respondents	Percentage (%)
20 – 30	30	12
31 – 40	60	24
41 – 50	80	32
51 – 60	55	22
61+	25	10
Total	250	100
Sex of the respondents		
Sex	NO. of respondents	Percentage (%)
Male	90	36
female	160	64
Total	250	100
Religious background of the respondents		
Religion	NO. of respondents	Percentage (%)
Christianity	210	84
Islam	5	2
Others	35	14
Total	250	100
Profession affiliation		
Profession	No. of respondents	Percentage (%)
Doctors	10	4
Nurses	180	72
Pharmacy staff	15	6
Health information Mgt.	25	10
Medical Laboratory staff	14	6
Others	6	2
Total	250	100
Allocation of questionnaire according to hospitals		
Hospital	No. of respondents	Percentage (%)
General hospital Ogoja	100	40
General hospital Obudu	80	32
General hospital Obanliku	70	28
Total	250	100

Source: questionnaire

The data in table one above shows the age of respondents. The data revealed that 30 respondents, representing 12% were within the age bracket of 20 to 30 years; 60 respondents, representing 24% were within the age bracket 31 to 40 years; 80 respondents, representing 32% were within the age bracket 41 to 50 years; 55 respondents, representing 22%, fall within the age bracket of 51 to 60 years; and 25 respondents representing 10%, were within 61 years and above. It was observe from the data that respondents within the age bracket of 41 to 50 years dominated the study, they were 80 (32%).

The data on the sex of respondents revealed that, 90 respondents, representing 36% were male and 160 respondents, representing 64% were females. The data revealed that female respondents were more than the male.

The religious status of respondents were presented in the table. The data revealed that; 210 respondents, representing 84%, were Christians; 5 respondents, representing 2%, were Muslims; and 35 respondents, representing 14%, were engage in various forms of worship. Christians dominated in the study. This may be due to the fact that the study was carried out in a Christian dominated environment.

The analysis of professional affiliation revealed that; 10 respondents, representing 4%, were doctors; 180 respondents, representing 72%, were Nurses; 15 respondents, representing 6%, were Pharmacy staff; 25 respondents, representing 10%, were health information management staff, 15 respondents, representing 6%, were medical laboratory staff; and 5 respondents, representing 2%, were from other units. However, Nurses dominated in the study, they were 180 respondents, representing 72%.

The analysis of the distribution of questionnaire was based on the staff strength of the hospitals. General hospital, Ogoja has staff strength of 360, hence has 100 questionnaire, representing 40%; General hospital Obudu with 240 staff has 80 questionnaire, representing 32%; and General hospital Obanliku with 230 staff has 70 questionnaire, representing 28%.

Awareness and knowledge of professional teamwork in the hospital

Table 2: Awareness and knowledge of teamwork in the hospital

NO	Questionnaire item	YES	%	NO	%	TOTAL
6	Do you know what professional team work is?	185	74	65	26	250
7	Do you practice professional team work in your hospital?	135	54	115	46	250
8	Do you enjoy working with other professionals while on duty as a team?	150	60	100	40	250
9	Does your working with other health professionals as a team enable you share ideas?	170	68	80	32	250
10	Does your working together as a team makes the job easier for you?	135	54	115	46	250
11	Have you been exposed to any form of training on professional team working?	140	56	110	44	250

Source: questionnaire

Table 2: summarizes the respondents' responses on awareness and knowledge of professional team work in the sampled hospitals. 185 (74%) respondents said they were aware and have knowledge of professional team work, while 65 (26%) said they do not. 135 (54%) respondents accepted that professional team work is practice in their hospital, while 115 (46%) said professional team work is not practice in their hospitals. 150 (60%) respondents, accepted that they enjoy working as a team, while 100 (40%) respondents said they do not enjoy working as a team with others. It was also observed that 170 (68%) said working with other health professionals as a team enable them share ideas, 80 (32%) respondents said it does not. 135 (54%) respondents said working together as a team makes the job easier, while 115 (46%) said it does not. 140 (56%) respondents said they have not been exposed to any form of training in professional team work, while 110 (44%) said they have.

Section 3: Team work relationship among health workers in the hospital

Table 3: teamwork relationship among health workers in the hospital

NO	Questionnaire item	YES	%	NO	%	TOTAL
12	Do you have work teams in your hospital?	143	57	107	43	250
13	Will you support the establishment of teams in your hospital?	205	82	45	18	250
14	Do you think the present ways of organizing activities in patient care in your hospital promotes the establishment of team work?	196	78	54	22	250
15	Does team work in your organization enable your colleagues to make meaningful contributions?	235	94	15	6	250
16	Does team work often result in conflicts among your work colleagues or other professionals in your hospital?	60	24	190	76	250
17	Does conflict caused some staff to feel that their jobs have been taken away from them by some of their colleagues?	118	47	132	53	250

Source: questionnaire

Table 3 above presents respondents' responses on professional teamwork relationship among health workers in the sampled hospitals. From the table, 143 respondents, representing 57% accepted that they have professional work teams in their hospitals, while 107 respondents, representing 43% said NO. 205 respondents, representing 82%, accepted that professional work teams should be establish in their hospitals, while 45 respondents, representing 18%, said NO. 196 respondents, representing 78%, supported that the present ways of organizing activities in patient care in their hospital promotes the establishment of professional team work, while 54 respondents, representing 22%, disagreed.

235 respondents, representing 94%, accepted that professional team work enable their colleagues to make meaningful contributions, while 15 respondents, representing 6%, disagreed. 60 respondents, representing 24%, accepted that professional team work often result in conflicts among colleagues / other professionals, while 190 respondents, representing 76%, disagreed to it. 132 respondents, representing 53%, accepted that professional team work caused some staff to feel that their schedules have been usurped or taken away from them, while 118 respondents, representing 47% disagreed.

Section 4: Respondents' perceptions of and attitude towards professional team work in the hospital.

Table 4: respondents' perceptions of and attitude towards professional team work

NO	Questionnaire item	YES	%
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18	Which of the following express your experience in the course of your working in the hospital?					
	• Being told that some schedules are meant for specific or other professionals	87				35
	• Being told that certain responsibilities are a no go area	62				25
	• Working arrangement emphasized professional boundaries	56				22
	• Being harassed for interfering with other peoples' responsibilities	45				18
TOTAL		250				100
	Questionnaire item	YES	%	NO	%	TOTAL
19	Do you consider team work as a useful approach to effective and sustainable high quality care in your hospital?	190	76	60	24	250
20	Do you think it is possible to form professional teams in various departments of your hospital?	220	88	30	12	250
21	Do you think inter professional team work is necessary for the maintenance of departments/ units in your hospital?	210	84	40	16	250
22	Does team work promote peaceful co- existence as you work in the hospital?	201	80	49	20	250
23	Superior and inferior relationship is a hindrance to team work	220	88	30	12	250

Source: questionnaire

Table 4 above shows respondents' perceptions of and attitude towards team work. In questionnaire item 18, respondents were to express their experiences in relation to team work in their institutions; being told that some jobs are meant for other professionals has 87 respondents, representing 35%; 62 respondents, representing 25%, said that certain jobs are meant for a particular people; 56 respondents, representing 22% said Working arrangement emphasized professional boundaries; and 45 respondents, representing 18%, said they were being harassed for interfering with other peoples' responsibilities.

On whether team work is consider as a useful approach to effective and sustainable high quality care in their hospitals; 190 respondents representing 76% said YES, while 60 respondents, representing 24% said NO. 220 respondents, representing 88% said the formation of professional teams in various departments of their hospitals is possible, while 30 respondents, representing 12% said NO. 210 respondents representing 84%, accepted that inter professional team work is necessary for the maintenance of departments/ units in their hospitals, while 40 respondents representing 16% said it was not possible. 210 respondents representing 80%, said team work promote peaceful co- existence as you work in the hospital. While 49 respondents representing 20% disagreed. 220 respondents representing 88% said superior and inferior relationship is a hindrance to team work, while 30 respondents, representing 12% disagreed.

Discussion

This study seek to investigate awareness and knowledge of health workers towards professional team work in Government hospitals in Northern senatorial district of Cross River State, Nigeria. Three government hospitals were sampled for the study. A structured questionnaire was design and 250 copies were printed and distributed to respondents from the three hospitals for completion. The data were extracted from the questionnaire, which form the bases for discussion and analysis.

The result of the study shows high awareness and knowledge of team work in the sampled hospitals. Out of the 250 respondents studied, 185 (74%) indicated that they have knowledge of team work while 65 (26%) said NO. Also, 170 (68%) respondents accepted working as a team and 135 (54%) respondents said working as a team makes the job easier for them. However, the study revealed that awareness and knowledge of professional team work was based on training; 140 (56%) respondents accepted that they were exposed to team work training. Most of the respondents who accepted being exposed to team work training were from General hospital Ogoja and General Hospital Obanliku. The reason for low awareness and poor knowledge of team work at General hospital Obudu could be due to the fact that the hospital has just been established and most of the workers have not been trained on team work. From the result of the study, it can be observed that professional team work may not be an aspect of the training programme for some health workers. Thus, those who have knowledge and are aware of it benefits tend to embrace it in their work environment.

An assessment of team work relationship revealed that, majority of the respondents want professional teams to be formed in their health institutions. 205 (82%) respondents indicated that work teams should be formed in their organizations. Formation of work teams will be fertile to the growth of the hospitals as the respondents recognised that team work will enable

staff to make meaningful contributions and it is not a strategy to create conflict or acrimony in the hospital. Formation of work teams will also increase efficiency and create opportunity for easy resolution of patients' problems.

The fact that health care industry is a multidisciplinary area, defines boundaries and specifies where every professional has to work and stop. When team work bring them together, each professional makes his / her own contribution from their various experiences what they feel can help to resolve patient's problem. Thus, specialization makes certain responsibilities to be strictly meant for or reserve for a particular professional(s), by virtues of their training. The study further revealed that team work is a useful approach to effective and sustainable high quality care in the sampled hospitals; 190 (76%) respondents indicated in favour and 60 (24%) respondents said NO. It has been observed that the formation of team work is inevitable, it will promote peaceful co-existence of the staff in the hospital.

The issue of superior and inferior dichotomy seem to be a hindrance in team work relationship in the study area. This may be as a result of the doctors and Nurses feeling that, they are the major stakeholders in healthcare industry and have control over the patient than other professionals. However, adequate orientation or awareness can be created to overcome this hurdle.

Conclusion

Based on the above premise, we conclude that there is fair awareness and knowledge of team work in the research area. Team work should be promoted in the hospitals to enhance effective and efficient health services delivery to patients. Departmental or units heads should be encourage to form work groups and in – house seminars or workshops can be organized to create awareness and improve the knowledge of staff on team work in the study centre.

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Maternal and Child Well-being Programmes' factors as determinants of male-partners' level of participation in the programmes in Kiambu County, Kenya

Dr.Kagendo Jane Francis¹ Prof. Leonard Musyoka Kisovi² and Dr.Samuel Ojuk Chuuk Otor²

¹Department of Geography, Kenyatta University,

²Department of Geography, Kenyatta University,

²Department of Environmental studies, Kenyatta University

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Abstract- International development platforms and commitments have expressed the need for male-partner participation in Maternal and Child Wellbeing (MCW) programmes pointing to the beneficial effects of their participation. Men have a clear role in decision making regarding their families' reproductive health, however their participation has remained low especially in Sub-Saharan Africa. Many factors could be implied for their low level of participation some of which are related to the programme policies and their implementation. In Kiambu County, Kenya, where this study was carried out, a low (3%) male partner level of participation in maternal and child well-being programmes (Kiambu County Strategic Plan for 2008-2012) was identified as a challenge to successful implementation of the programmes. There was no earlier study on factors that could be implied for the low male participation. This study sought to determine if there existed a significant relationship between the current maternal and child well-being programmes and the male partners' level of participation in the programmes in the County. To achieve this objective a cross-sectional analytical study involving 142 males partners to women consuming the MCW services at level four and level five health facilities in Kiambu County, Kenya, was conducted between February 2016 and May 2016. A male partner's level of participation index was used to determine high and low levels of participation in the programmes. The study collected primary and secondary data which were both qualitative and quantitative. Descriptive as well as empirical analytical techniques were used to test for significance of the relationship between MCW programmes and the male partners' level of participation. The findings of the study revealed a negative and significant relationship between the predictor variable (current maternal and child well-being programmes) and the outcome variable (level of male partner participation in the programmes). The study found that male-partners who had a negative perception towards the current maternal and child well-being programme policies and how they are implemented registered a lower level of participation compared to those who had a positive perception. The findings are important in guiding policy formulation in coming up with programmes that are male friendly. This may be done through involving male partners as key stakeholders during policy formulation in order to incorporate their special reproductive health needs. This participatory approach may be expected to

improve communication and decision-making processes leading to coming up with male friendly maternal and child well-being programmes. This approach may in the long run lead to increased male partner participation in the programmes and the subsequent improved consumption of the services and higher retention in the programmes of their female partners and infants. This may lead to reduction of maternal and infant morbidity and mortality rates in Kiambu County as well as the National rates. This will be a positive step to achieving the social goal in Kenya's Vision 2030 by shifting health care services from curative to preventive. This may also support a more economically productive female population and healthy infants. It will be a step towards achieving Sustainable Development Goal 3 on achieving Good Health and Well-being.

Index Terms- Maternal, child, morbidity, mortality, and well-being programmes

I. INTRODUCTION

Recent research at the global level has shown that responsibility for uptake and sustainability in uptake of maternal and child wellbeing (MCW) services is a responsibility for both female and male parents however in most of the cases it is looked at as a female's [40,41]. International development platforms and commitments have emphasised the need for male participation in the programmes considering the benefits associated with it and without which the programmes are doomed to fail [38, 28]. Globally, high maternal and infant mortality and morbidity rates have been associated with this low male partner support for their female partners [42, 24]. In developing countries most of which are in the Sub-Saharan Africa, infant mortality rate is estimated at 239/100,000 live births [3, 4]. Maternal and child well-being programme related factors such as institutional infrastructure[8], time the services are offered at the health facilities [36] as well as the behaviour of health care providers towards the males have been implied for their low level of participation [1]. The prevailing reproductive health programmes are a reflection of traditional organisation in maternal and child well-being programmes that were institutionalized as a women's sphere where male-partners were deliberately excluded [17, 18]. Little has changed in recent times

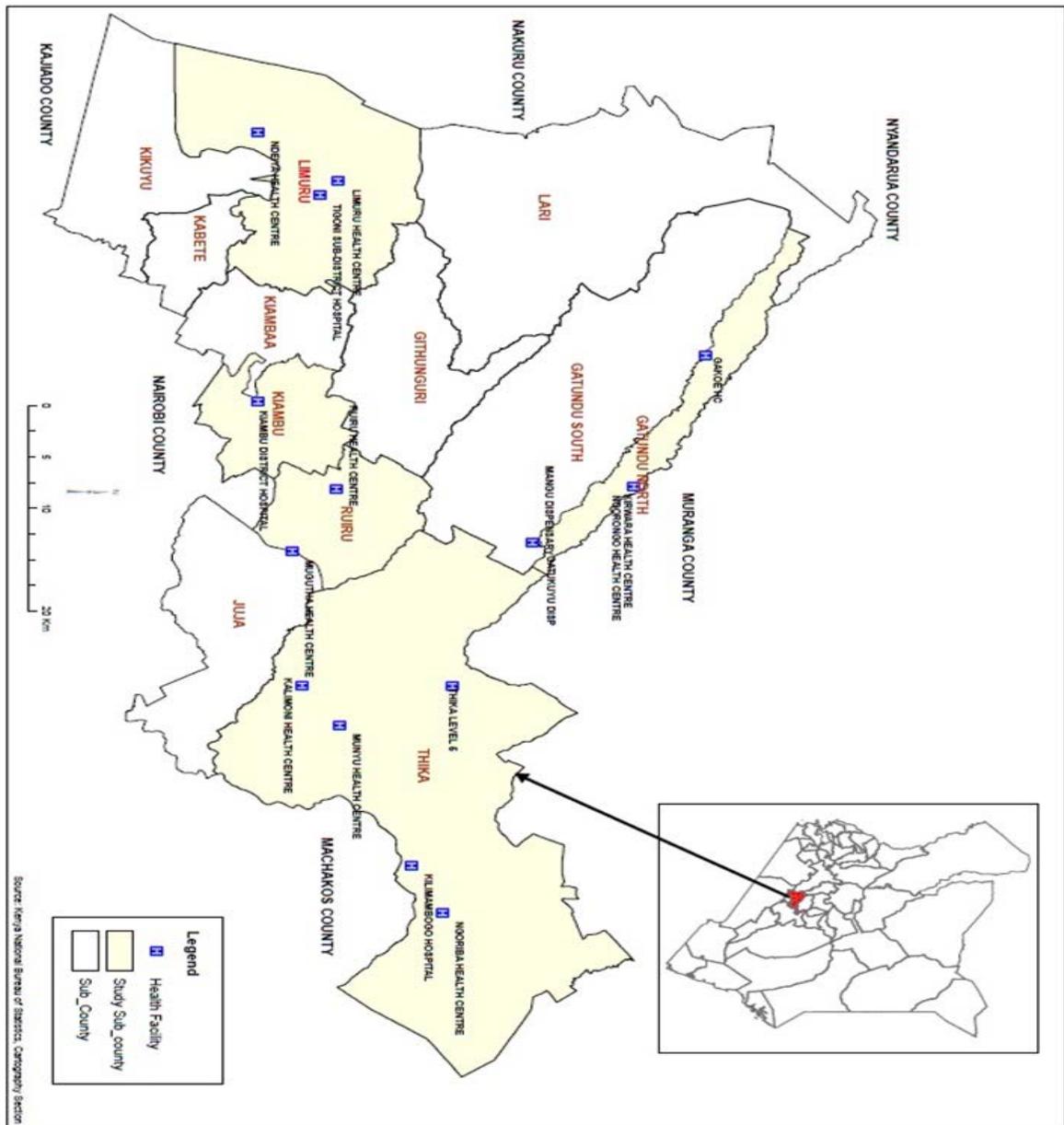
to accommodative men in terms of infrastructure, service delivery hours and accommodation of male special needs among others [5, 16]. Inadequate infrastructure at the health facilities discourages male partners who are unable to complete with their female partners and the infants for the available space [11, 19]. Men only clinics or men only times at the health facilities may help to reduce this congestion and as well as reduce time spent in seeking the services [10, 20]. Physical layout within which the services are offered such as inadequate sitting space and sitting arrangements discouraged male participation [12, 9]. Long waiting hours and service hours conflicted with male partners' income generating activities [27, 7]. Family oriented approaches to maternal and child health programmes may improve male partners' level of participation [33, 35]. Distrust in confidentiality of the health care providers during VCT also discouraged male-partner participation [22, 37]. Health care provider attitudes towards male partners who accompanied their female partners to the health facilities discouraged them from attending the services with their partners [13, 15]. Limited reproductive health service choices for men such as contraceptives, clinic service delivery hours and health facility attendance hours within the maternal and antenatal clinics was intimidating and unsupportive of the male's participation [6, 14]. Men's stoic nature is also a drawback to male partner participation in VCT because they deemed themselves healthy and in control of their health a factor that conflicted with the requirement that they seek health care and especially with their female partners [34, 21]. Maternal mortality rate in Kenya is 362/100,000 live births [25,26], while the infant mortality rate is 52/1,000 live births [29] while 26 /1,000 infants suffer malnutrition [31,32]. World Health Organisation [30] ranked Kenya in position 39th in the less than five deaths at the global level [39]. Most of these high maternal and infant morbidity and mortality rates in Kenya have been associated with insufficient consumption of the MCW services due to low support accorded them by their male partners [2]. In Kiambu County where the study was carried out, like of parts of Kenya, registered a low (3%) male-partner participation in the M CW programmes. This had been identified by the County Health care management as a challenge to successful implementation of the programmes in Kiambu County [23]. There was no evidence of a study conducted to determine factors that could be implied for this low male participation. This would guide policy formulation and programme implementation to limit barriers and strengthen facilitators to male participation. The aim of this study was to

determine the effects of maternal and child wellbeing programme factors on male partners' level of participation in the programmes in Kiambu County.

II. METHODOLOGY

The current study adopted a cross-sectional descriptive analytical design. The study was carried out in Kiambu County, Kenya. The study aimed at establishing existing relationships between the male-partner's level of participation in maternal and child well-being programmes and the effects of programme related factors. Kiambu County just like other Counties in Kenya register low level of male-partner participation in the programmes and this is considered as a challenge to successful implementation of the programmes. The study collected data on level of male-partner's participation in the programmes (dependent variable) and on the presumed predictor variables (the effects of the current maternal and child well-being programme policies and their implementation which were referred to as programmes related factors). The target population for the study were male-partners to female partners who were nursing babies aged five years and below and who were consuming the maternal and child wellbeing services at the health facilities in Kiambu County during the time of the study. Data were collected from one hundred and forty two respondents were introduced to the study by their female partners. The female partners had been selected systematically as they came to the health facilities with their infants to consume the services. Consenting female-partners were requested to introduce their male-partners, whose consent for inclusion into the study was also sought. Qualitative as well as quantitative data were collected for the study. The collected data were subjected to descriptive as well as empirical analysis to establish causal inferences about hypothesised relationships between dependent and independent variables. This helped in testing of the study hypothesis that... *there is no significant relationship between male-partners' level of participation in maternal and child well-being programme sin Kiambu County and the programme related factors.* The study helped to identify significant predictor variables that were implied for the low level of male-partners' participation in the programmes in the County.

Figure 1. Map of the study site on inset map of Kenya



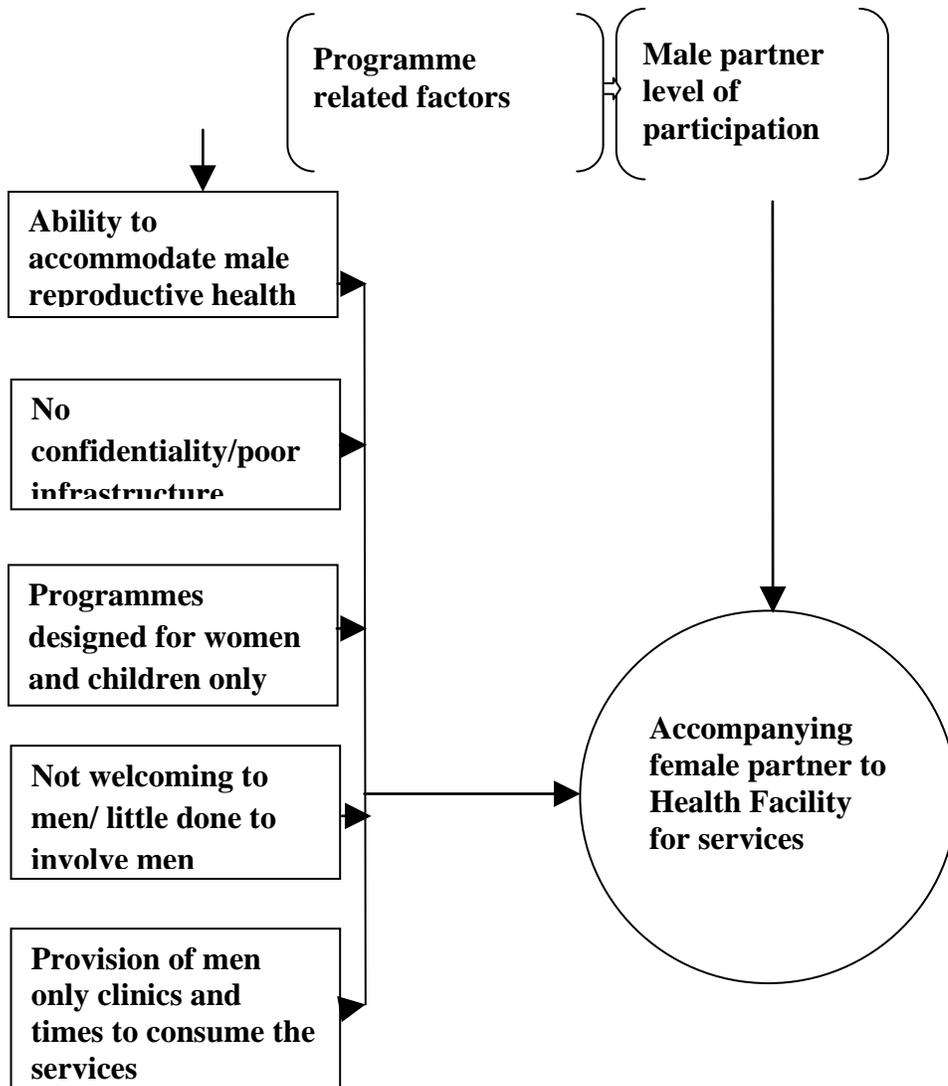


Figure 2 Conceptual framework

III. STUDY FINDINGS

The study findings revealed that maternal and child well-being programme related factors in Kiambu County had significant negative impact on the male partners' level of participation in the programmes. For instance, Chi-square test as used to test for independence of the male partners' level of participation in the programme against the predictor variables and the following findings were registered; the effects of male-partners' perception towards provision of men only clinics revealed ($\chi^2=90.54,df=1,p=0.000$), effects of male perception that health care providers were not welcoming to the male partners at the health facilities ($\chi^2= 109.4,df=1, p=0.000$), effect of the perception that the programmes were designed for women and children only ($\chi^2=38.55,df=1, 0.000$), effects of perception that

little has been done to welcome male-partners to the health facilities ($\chi^2 = 22.34,df=1,p=0.000$), effect of perception that the programmes were not accommodative to male reproductive health needs ($\chi^2= 40.901,df=1,p=0.000$), effect of perception that accompanying their female partner to the health facilities was consuming ($\chi^2 = 74.22,df=1,p=0.000$) and effects of the male perception that health facilities were inaccessible ($\chi^2= 74.22,df=1,p=0.000$). The Nagelkerke R^2 model for current programme related factors obtained a value of 0.928, which meant that programmes related factors explained 92.8% of the variation in male partner's level of participation in the programmes in the County.

Table 1: Summary model for effects of current maternal and child well-being programme related factors in Kiambu County

Model Summary	
-2 Log likelihood	21.535
Cox & Snell R Square	0.646
Nagelkerke R Square	0.928

Logistic regression for effects of programme related factors on male-partners’ level of participation in maternal and child well-being programmes in Kiambu County.

Logistic regression conducted on the collected data to test for the relationship between the male partner’s level of participation and the effects of programme related factors revealed a significant negative relationship; $y = (\alpha) 0.700 (-0.571)$. The probability (odds) of high level of participation (Table 2) was 4.88 times lower for male-partners who had the perception that the programmes were designed for women and children only compared to those who had a different perception and 5.75 times lower for male-partners who felt that health care providers were not welcoming to males who accompanied their female partners to the health facility compared to those who had a positive perception. Exp (B) column (the **Odds Ratio**) revealed that male-partners who agreed that health facilities offering

maternal and child well-being services are located far from home/work were 1.78 times less likely to register a high level of participation compared to those who disagreed. The probability (odds) of high level of participation was 5.50 times lower for male-partners who thought that the HFs did not provide confidentiality to the patients who went for HIV testing compared to those who felt that there was confidentiality. This negatively influenced their participation in couple VCT. The probability of high participation was 4.61 times lower for male-partners who felt that little had been done to accommodate male partners’ reproductive health needs compared to those who felt that their needs were taken care of.

Table 2. Logistic regression for effects of programme related factors on male-partners; level of participation

Table 2. Logistic regression for effects of programme related factors on male-partners; level of participation							
	B	S.E.	Wald	df	Sig.	Exp(B)	1/Exp(B)
Men Clinics(1)	1.142	0.266	18.432	1	0.000	3.133	
Unwelcoming(1)	-1.75	0.407	18.488	1	0.000	0.174	5.75
MCW designed For women children(1)	-1.586	0.499	10.102	1	0.001	0.205	4.88
Little done involve men(1)	-1.529	0.743	4.235	1	0.040	0.217	4.61
No confidentiality(1)	-1.704	0.553	9.495	1	0.002	0.182	5.50
	1.034	0.815	1.610	1	0.205	2.812	
Tested by nonresidents(1)	1.876	0.789	5.653	1	0.017	6.527	
Costly for two(1)	1.697	0.673	6.358	1	0.012	0.183	5.46
Costly for two(2)	-0.625	0.304	4.227	1	0.040	0.535	1.87
Time(1)	-1.124	0.478	5.529	1	0.019	0.325	3.08
Dugs)(1)	1.12	0.231	23.508	1	0.000	3.065	
Distance(1)	-0.576	0.261	4.870	1	0.027	0.562	1.78
Men be trained(1)	-1.996	0.832	5.755	1	0.016	0.136	7.36
Accommodate male health needs(1)	1.302	0.401	10.542	1	0.001	3.677	
Be attended by males (1)	1.849	0.636	8.452	1	0.004	6.353	
Constant	-1.155	0.275	17.640	1	0.000	0.315	3.17

The study findings implied a significant negative relationship between male-partners’ perception of the current maternal and child well-being programmes policies and their implementation versus their level of participation in the programmes. The hypothesis that male-partners’ perception of the current maternal and child well-being maternal and child well-being programmes policies and their implementation does not influence their level of participation in the programmes in Kiambu County was therefore rejected and the alternative hypothesis accepted. Current maternal and child well-being programme policies have in deliberately adopted historic institutionalisation of reproductive health services as a woman’s domain excluding male-partners through the institutional infrastructural organisation which have not changed to

accommodate male-partners. Service delivery hours and non-accommodation of male reproductive health needs have kept the male-partner a bay. In the recent past, emerging issues in reproductive health such as mother to child transmission of HIV have however created urgent need to accommodate the male-partner into the programmes. Male partners should be involved not as a passive facilitators for the female and infant health services but as an active constituent part of the programmes’ policy formulation and their implementation. The study found that majority of the male-partners who had the perception that the current maternal and child well-being programmes were not accommodative to the male special reproductive health needs registered a lower level of participation compared to those who felt that they were. This mean that male-partners’ negative

perception towards the programme policies and their implementation in Kiambu County had negative significant influence on their level of participation. The findings of the study portrayed that current programmes were unfriendly and unaccommodated to male-partner's special reproductive health needs which may have been a challenge in involving and sustaining male-partner participation in the programmes. For instance, there is a negative significant relationship between male partners' perception that health care providers are not welcoming to male-partners versus their level of participation. Male-partners were not allowed to join their female partners and the infants into the consultation rooms, which made their visit to health facilities loose meaning. Some healthcare providers were not welcoming to male-partners by being rude and even abusive a factor that discouraged further visits by the males. This made the male-partners perceive themselves as intruders into the women's and the infants' domain and opted to keep off. In other instances men seemed very inconsiderate, unkind and unreasonable if they sat down on seats while an expectant woman or a mother had lacked a seat due to inadequate infrastructure at the health facilities. This discouraged male partners who either walked out to wait for their partner outside or went away never to accompany their female-partner to the health facility again. The male-partners expressed optimism that the men only clinics or men only times for consuming the services would be less congested and they would spend little time at the health facilities. The facilities would be less noisy than the current situation and may attract more male-partners than the current situation. Majority of the respondents explained that during the day when the maternal and child wellbeing services were offered, most of the male-partners were busy with their economic activities causing conflict of interest. Long queues and long waiting hours at the health facilities mostly caused by limited number of days in a week when the services were offered also discouraged the male partners. This is compounded by long procedures they have to follow from payment queues, to training sessions, consultations and actual receiving of the services. The female-partners spend a whole day seeking the health services. Male-partners on the other had would become impatient and leave the female-partners to continue with the queues. The male partners who accompanied their female-partner during delivery also complained of not being allowed to accompany them to the wards during labour and delivery. The delivery rooms were treated as a feminine zone an aspect that discouraged male-partners from accompanying their female-partner to the health facilities during delivery.

The study revealed that during the postnatal clinics the healthcare providers paid attention to the mothers and the infants ignoring male-partners seemed mere escorts. This may explain why majority of the male-partners had accompanied their female-partner to the health facility only once or twice after which they stopped. The study found that majority of male-partners perceived themselves as intruders who added more workload to health facilities that were already overstretched by women and their infants. The study found that this perception contributed to the low level of male-partner participation in the programmes in Kiambu County. These findings imply a positive significant relationship between male-partners' perception that health care providers were not welcoming to the male partners and the outcome which is a low level of participation. These results also

imply a positive significant relationship between male-partners' perception that the programmes were designed for women and children only with little or no consideration for male partner and the subsequent level of participation. The study findings also revealed that there is significant relationship between male-partner perception that the health facilities were not confidential during VCT and the outcome level of participation during couple VCT.

The relationship between MCW programmes related factors and male-partner's level of participation in the programmes in Kiambu County was found to be significant and negative. These findings are important in guiding policy formulation in coming up with maternal and child well-being programmes that are male friendly. This may be done through involving male partners as key stakeholders during policy formulation in order to come up with policies that meet their special reproductive health needs. This participatory approach would be expected to improve communication and decision-making processes leading to male friendly maternal and child well-being programmes. This approach may in the long run lead to increased male partner participation in the programmes and the subsequent increased consumption of the services by their female partners and infants. This may eventually lead to reduction in maternal and infant morbidity and mortality rates in Kiambu County and also imply on the national level rates.

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AUTHORS

First Author – Dr. Kagendo Jane Francis1, (Ph.D), Kenyatta University: janendeke@gmail.com

Second Author – Prof. Leonard Musyoka Kisovi2, Kenyatta University: kisovimusyoka@gmail.com

Third Author – Dr. Samuel Ojuuk Chuuk Otor3, Kenyatta University: cjotor@yahoo.com

Correspondence Author – Dr. Kagendo Jane Francis1, (Ph.D), Kagendo.jane@Ku.ac.ke, +254721576267

Allocation, Availability and Maintenance of School Facilities as Correlate of Academic Performance of Senior Secondary School Students in Adamawa State, Nigeria

Dr. K. T. Takwate

Adamawa State University, Mubi
Department of Science Education

taquate@yahoo.com

08081411058

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Abstract

This study investigated school facilities allocation, availability and maintenance as correlate of academic performance of Senior Secondary School students in Adamawa State, Nigeria. Correlational research design was adopted for the study. A sample of 153 school principals and 377 teachers were randomly drawn from 248 senior secondary schools and 6,450 teachers respectively using proportionate sampling technique. Two questionnaires titled "School Facilities Planning and Allocation Questionnaire (SFAQ) and Management of School Facilities Questionnaire (MSFQ)", students' academic performance proforma and checklist were used for data collection. The reliability coefficient of SFAQ and MSFQ after validation was 0.82 and 0.76 respectively using Cronbach alpha. Mean scores, standard deviations and Pearson Product Moment Correlation Coefficient was used for answering the research questions and hypotheses. Allocative and maintenance efficiency of school facilities was found to be inefficient and efficient respectively. The Level of availability of school facilities was rated as not available and level of students' academic performance in WAEC/SSCE May/June 2013 – 2015 was found to be poor. The study revealed a significant relationship between school facilities allocative efficiency, availability, maintenance efficiency and students' academic performance in Adamawa State, Nigeria. The study recommended among others that government should adequately equip all Senior Secondary Schools in the State using appropriate procedures for facilities planning and allocation, school principals should frequently carry out comprehensive assessment of facilities in their schools to determine areas of need, and the Ministry of Education should promptly provide fund for the maintenance of school facilities as they receive report from schools.

Keyword: School Facilities, Allocation, Availability, Maintenance, Academic Performance

Introduction

Different kinds of problems ranging from mismanagement of allocated resources to declining standard of education are being experienced in the Nigerian education system (Olaniyan & Anthony, 2013). These according to Amuche, Amuche, Bello and Marwan (2014) result in dwindling performance of students in external examinations such as the Senior School Certificate Examinations (SSCE) organized by West African Examination Council (WAEC).

Public outcries about the poor maintenance of available school facilities in some secondary schools in Nigeria have yielded little or no result. School administrators seem not to show much effort in tackling the problems as evidenced by poor handling of the school facilities (Danjuma & Adeleye, 2015). This is why a casual visit to any public secondary school in Nigeria (Abah, 2016) reveals the extent to which these educational institutions have decayed. School facilities are in a terrible shape.

Reports from Owoeye and Yara (2011); Waweru and Orodho (2013) and Jackline and John (2014), have attempted to examine the relationship between allocation and maintenance of school facilities and students' academic performance and reveal rather good relationship. Effective maintenance of school facilities according to United Nations Educational, Scientific and Cultural Organization (UNESCO, 2006) is judged by the extent to which schools generally meet the expectations of the society within which they are established. These expectations are better seen in students' academic performance.

According to Saad (2010), lack of basic facilities and other related factors such as poor maintenance have been noted as some of the problems that cause poor students' academic performance in Nigeria and Adamawa State in Particular. Adamawa State comprises five education zones (Mubi, Gombi, Numan, Ganye and Yola). The academic performance of Senior Secondary School students in SSCE organized by WAEC in Adamawa State compared to other States in Nigeria has been very poor during the years under review (2013 – 2015) (Collins, 2015; Abah, 2016). The poor performance has made it difficult for majority of students to gain admissions into higher institutions of learning in recent times. For instance, Collins (2015) found that about 93% of senior secondary school leavers in any given year fail to qualify for university education in Adamawa State. The researcher reported that only 7.87% had 5 credits including English Language and Mathematics in 2013 ranking least (27th and 28th in 2014 and 2015) among other States whose students obtained 5 credit passes including English Language and Mathematics in Nigeria (Abah, 2016).

Despite the views of different writers, Saad (2014), Udonsa and Udonsa (2015) and Abubakar (2016), maintained that secondary schools in Adamawa State are generally ill-equipped for instruction; lack good seats and desks for students to write and are overcrowded. It is on this premise that this work investigated the allocation, availability and maintenance efficiency of school facilities as correlate of academic performance of Senior Secondary Schools students in Adamawa State, Nigeria.

Statement of the Problem

Poor allocation and maintenance of educational facilities has been examined by educationists (Badau, 2010; Danjuma & Adeleye, 2015; Neji & Nuoha, 2015) in the different States of Nigeria and concluded that States have not been able to plan, allocate and maintain educational facilities even where there is evidence of funding of capital projects. Senior secondary schools in Adamawa State face the combined challenges of deteriorating conditions, out-of-date design and administrative inefficiencies of educational resources (Saad, 2014; Abubakar, 2016). These combined deficiencies impair the quality of school management, curriculum delivery and students' academic performance.

Auta (2012) opined that lack of adequate facilities result in depression in the student's academic programme and waste of resources. The situation actually tends towards threatening the future of the State. The reports of surveys (Eguridu, 2012; Anaba, 2013; National Bureau of Statistics, 2014; Udonsa & Udonsa, 2015)), pointed to the poor performance of students in Adamawa States, Nigeria and was largely attributed to poor management of school facilities. It was against this background that this study sought to determine the basis for school facilities allocation, availability and maintenance efficiency as correlates of academic performance of senior secondary school students in Adamawa State, Nigeria.

Theoretical Framework

This study is based on Yutchman and Seashore's (1967) System Resource Theory of Organizational Effectiveness. The theory states that, an organization is said to be effective when it has the ability to secure an advantageous bargaining position in its environment and capitalize on that position to acquire, judiciously distribute, and monitor utilization of scarce resources. The theory viewed an organization such as schools as open systems which can be resourceful when it is able to adequately acquire, rationally distribute, efficiently utilize and regularly maintain scarce resources in implementing its programmes. Since the effectiveness of an organization is measured in terms of its capability to acquire resources, utilize and maintain them in achieving the organizations objectives, Yutchman and Seashore (1967) system resource theory of organizational effectiveness is relevant to this study.

Research Questions

1. What is the level of school facilities allocative efficiency in Senior Secondary Schools of Adamawa State, Nigeria?
2. What is the level of availability of school facilities allocated to Senior Secondary Schools in Adamawa State, Nigeria?
3. What is the level of school facilities maintenance efficiency in Senior Secondary Schools of Adamawa State, Nigeria?
4. What is the level of senior secondary school students’ academic performance in Adamawa State, Nigeria?

Research Hypotheses

1. There is no significant relationship between the level of school facilities allocative efficiency and academic performance of senior secondary school students in Adamawa State, Nigeria;
2. There is no significant relationship between the level of school facilities availability and academic performance of senior secondary school students in Adamawa State, Nigeria; and
3. There is no significant relationship between the level of school facilities maintenance efficiency and academic performance of senior secondary school students in Adamawa State, Nigeria;

Methodology

Correlational research design was adopted for the study. The study was carried out using all the public Senior Secondary Schools in Adamawa State, Nigeria (9°20’N 12°30’E). The target population for this study was 6,717 consisting of nineteen (19) staff of Adamawa State Ministry of Education Planning Division, 248 school principals and 6,450 teachers of all the Senior Secondary Schools in the five education zone. 549, made up of 19 staff of Adamawa State Ministry of Education planning division, 153 school principals and 377 teachers was sampled for the study. Four research instruments titled School Facilities Allocation Questionnaire (SFAQ), Management of School Facilities Questionnaire (MSFQ), Checklist and students’ academic performance proforma structured on a four-point response scale. The reliability coefficient for the two questionnaires (SFAQ and MSFQ) was 0.82 and 0.76 respectively. Mean scores and standard deviation was used to answer research questions. Pearson Product Moment Correlation Coefficient (r) was used for testing the null hypotheses. The decision for the research questions were based on the upper limit of 2.50. This implies that any grand mean above or equal to 2.50 was accepted to indicate efficiency and pass mark for students’ academic performance. The decision taken on the null hypotheses was based on comparing the computed p-values against 0.05 level of significance.

Research Question One: What is the level of school facilities allocative efficiency in Senior Secondary Schools of Adamawa State, Nigeria?

Table 1: Summary of Means and Standard Deviations of School Facilities Level of Efficiency in Senior Secondary Schools of Adamawa State

S/N	Items	n	VE	E	ME	NE	\bar{x}	s	Remark
1	Collective decision of the stakeholders in the school community	172	32	56	77	07	2.47	0.84	NE
2	School’s enrolment	172	19	112	34	07	2.30	0.72	NE
3	Critical needs of the schools	172	41	63	61	07	2.42	0.90	NE
4	School location	172	08	102	53	09	2.44	0.67	NE
5	The school’s performance in Senior School Certificate Examination (SSCE)	172	25	36	103	08	2.63	0.79	E
6	Number of subjects offered by students in the school	172	36	53	81	02	2.45	0.83	NE

7	Number of teachers in the school	172	22	30	113	07	2.74	0.73	E
8	Status of the school	172	24	96	52	00	2.13	0.63	NE
9	Schools' supervision report	172	19	99	39	15	2.44	0.80	NE
Grand Mean							2.45	0.77	NE

Result of analysis in Table 2 shows the mean and standard deviation of items on bases for allocating school facilities to senior secondary schools in Adamawa State. The grand mean of 2.45 and standard deviation 0.77 indicates that the basis used for allocating school facilities to senior secondary schools in Adamawa State is not efficient.

Research Question Two: What is the level of school facilities maintenance efficiency in Adamawa State Senior Secondary Schools?

Table 2: Summary of Means and Standard Deviations of School Facilities Level of Maintenance Efficiency in Adamawa State Senior Secondary Schools

S/N	Items	n	VE	E	ME	NE	\bar{x}	s	Remark
10	Cracks on buildings are repaired immediately after discovery	530	69	95	253	113	2.78	0.93	E
11	Broken furniture (chairs or tables) are quickly repaired	530	130	143	145	112	2.45	1.08	NE
12	Laboratory equipment are often cleaned to protect them from damage	530	49	139	190	152	2.84	0.95	E
13	School generator(s) are serviced regularly	530	54	100	224	152	2.89	0.94	E
14	School computers are regularly serviced	530	40	94	324	72	2.81	0.76	E
15	Preventive maintenance is carried out on school buildings	530	124	148	160	98	2.43	1.04	NE
16	Preventive maintenance is carried out on school equipment to avoid total breakdown	530	54	161	204	111	2.70	0.91	E
17	School buildings repairing are not delayed until they become worst	530	44	100	252	134	2.90	0.87	E
18	School equipment servicing are not delayed until they breakdown	530	44	100	251	135	2.90	0.88	E
19	The last time major school facilities repair was done in our school was more than 3 years	530	60	56	145	269	3.18	1.02	E
Grand Mean							2.79	0.94	E

Table 4 shows the mean and standard deviation of items on level of school facilities maintenance efficiency in Adamawa State senior secondary schools. The grand mean of 2.79 and standard deviation of 0.94 indicates that the level of school facilities maintenance by school administrators in Adamawa State senior secondary school is efficient.

Research Question Three: What is the level of availability of school facilities allocated to Senior Secondary Schools in Adamawa State, Nigeria?

Table 3: Summary of Mean and Standard Deviation of School Facilities Availability in Adamawa State Senior Secondary Schools

FACILITIES	n	VHA	HA	MA	NA	\bar{x}	s	Remark
Site facilities	530	127.14	67.57	140	195.29	2.24	1.03	NA
Academic Facilities	530	112.50	68.44	70.28	278.11	2.03	0.93	NA
School Furniture	530	114.43	90.86	138.14	186.57	2.25	1.09	NA
Sports Facilities	530	43.00	46.57	100.29	340.14	1.61	0.73	NA
Annex Facilities	530	27.63	39.13	90.88	372.38	1.48	0.78	NA
Administrative Facilities	530	56.60	76.60	159.40	235.40	1.93	0.84	
Grand Mean						1.92	0.90	NA

Table 3 shows the means and standard deviations of items on availability of school facilities allocated to senior secondary schools in Adamawa State. The grand mean of 1.92 and standard deviation 0.90 indicates that school facilities are not available in Adamawa State senior secondary schools.

Research Question 4: What is the level of students' academic performance in Adamawa State senior secondary schools?

Table 4: Summary of Means and Standard Deviations of Students' Academic Performance in WAEC/SSCE May/June 2013 – 2015 in Adamawa State Senior Secondary Schools

Year	N	A1 – B3	C4 – C6	P7 – P8	F9	\bar{x}	s	Remark
2013	5,935	351	1,754	1,565	2,265	2.27	0.64	Poor
2014	6,626	708	3,067	921	1,930	1.93	0.72	Poor
2015	4,435	844	408	862	2,321	2.32	0.89	Poor
Grand Mean						2.12	0.75	Poor

Table 4 shows the means and standard deviations of students' academic performance in 2013 – 2015 WAEC/SSCE in Adamawa State senior secondary schools. The grand mean of 2.12 and standard deviation of 0.75 indicates that students' academic performance was poor.

HYPOTHESE TESTING

Ho₁: There is no significant relationship between school facilities allocative efficiency and academic performance of senior secondary school students in Adamawa State, Nigeria.

Table 5: Summary of Pearson Product Moment Correlation Coefficient Level of School Facilities Allocative Efficiency and Students' Academic Performance

Variables	n	\bar{x}	r	p-value	Relationship	Remark
LSFAE	172	2.45	0.195	0.000	Low	Significant
LSAP	172	2.12				

Analysis in Table 5 shows that there was a significant low positive relationship between school facilities allocative efficiency and students' academic performance in Adamawa State senior secondary schools since p-value (0.000) is less than 0.05 the null hypotheses was rejected.

Ho₂: There is no significant relationship between the level of school facilities availability and academic performance of senior secondary school students in Adamawa State, Nigeria.

Table 6: Summary of Pearson Product Moment Correlation Coefficient level of school facilities availability and students' academic performance

Variables	n	\bar{x}	r	p-value	Relationship	Remark
LSFA	530	1.93	0.085	0.000	Low	Significant
LSAP	530	2.12				

Since the p-value (0.000) is less than 0.05 level of significance, the null hypothesis was rejected. The computed r-value - 0.085 indicates that there was a significant low positive relation between the level of school facilities availability and students' academic performance in Adamawa State senior secondary schools.

Ho₃: There is no significant relationship between level of school facilities maintenance efficiency and academic performance of senior secondary school students in Adamawa State.

Table 7: Summary of Pearson Product Moment Correlation Coefficient level of school facilities maintenance efficiency and students' academic performance

Variables	n	\bar{x}	r	p-value	Relationship	Remark
LSFME	530	2.79	0.260	0.000	Low	Significant
LSAP	530	2.12				

The result in Table 6 shows that there was a low positive relationship between school facilities maintenance efficiency and senior secondary school students' academic performance in Adamawa State. Since the p-value (0.000) is less than 0.05 and the computed r-value - 0.260, the null hypothesis was rejected.

Discussion of the Findings

The findings of this study were discussed in relation to the basis for allocating school facilities, availability and maintenance efficiency as correlates of students' academic performance raised in the study. The findings from Table 1 revealed that the basis for allocating school facilities to Senior Secondary Schools were not efficient in Adamawa State as indicated by the grand mean (2.45) and standard deviation (0.77) of the items (1 – 9). This finding contrast Alabi (2014), Neji, Ukwetang and Nja (2014) and World Bank (2016) report, which suggested that school facilities should be allocated to schools based on the effectiveness of public programs in schools that meet strategic educational objectives. It entails the capacity of authorities concern to shift scarce resources from old priorities to new ones, and from less to more effective school programs. In support of this finding, Ajayi and Yusuf (2009) revealed that learning facilities must be accessible to all regardless of any criterion and made available to the physical and emotional well being of all learners.

Table 2 shows that the basis for allocating facilities to Senior Secondary Schools in Adamawa State has not made school facilities available as indicated by the grand mean (1.92) and standard deviation (0.90). This study is consistent with Saad (2010) and Abubakar (2016) who reported that, site facilities like land for future expansion, academic facilities like Laboratories and relevant textbooks are rated not available by the respondents. The findings, therefore, confirm the submission of the Chairman of the National Task Force on implementation of Educational Policy (6-3-3-4) that what we have today as schools apart from Federal Government colleges are 'barren' schools which lack the bare necessities and as such the students are not getting enough good education (Adedeji in Owoeye & Yara, 2011). Aka (2005) equally reported the situation to be the same in the western Nigeria.

The findings from this study revealed the level of school facilities maintenance in Adamawa State senior secondary school to be efficient (Table 3). This was indicated by the grand mean (2.79) and standard deviation (0.94) on all items 10 – 19. Supporting the report from this study Vandiver (2011) and SchoolDude (2014) revealed that continuous existence and utilization of school facilities can only be achieved through quick and regular servicing and repairing of broken down facilities through preventive maintenance. On the contrary in Adamawa State, Allen (2015) revealed that management of school facilities through maintenance in secondary

schools has not being achieved and as a result schools have failed to achieve its intended objectives nowadays because facilities are not serviced or repaired promptly until they become worst or broke down in Nigeria.

The level of students' academic performance in WAEC/SSCE May/June (2013 – 2015) in Adamawa State Senior Secondary Schools (Table 4) was poor as indicated by the grand mean and standard deviation 2.12 ± 0.75 respectively. This finding is consistent with Anaba (2013) and Collins (2015) conclusions that the level of students' academic performance in Adamawa State senior secondary school was poor. In support of this finding Collins (2015) revealed that about 93% of senior secondary school leavers in any given year have fail to qualify for tertiary education in Adamawa State.

Hypothesis one (Table 5) indicate that there was a statistical significant relationship between level of school facilities allocative efficiency and students' academic performance in Adamawa State Senior Secondary Schools. This shows that allocating school facilities to senior secondary schools in Adamawa State based on some criteria like students' performance in external examinations (WAEC/SSCE), number of teachers and/or school's enrolment are fairly related to students' academic performance. In support of this finding, Okafor (2000), Duran-Naruck (2008) , Okoroma and Enyoghasim (2012) revealed that inefficient distribution of school facilities to schools results in either under-utilization or over-utilization which does not enhance effective academic performance.

Table 6 (Hypothesis two) shows that, there was a significant low positive relationship between level of availability of school facilities and students' academic performance in Adamawa State senior secondary schools ($r = 1.93, p < 0.05$). The findings also agreed with the findings of Othman and Musyoka (2014) that linked the decline in students' academic performance with non-availability of teaching materials, non- availability of class rooms, libraries and laboratories, among others. The findings also lend credence to the submission of Owoeye and Yara (2011); Bizimana and Rodho (2014); Danjuma and Adeleye (2015) that items like books, teaching aids and educational materials were not only unavailable in secondary schools but those available were grossly insufficient, over utilized and poorly managed. They concluded that such situation would result in sharp decline in students' academic performance in external examinations. The findings of this study regarding significant relationship between availability of school facilities and students' academic performance have a link with the findings of Oduwaiye, Sofoluwe and Kayode (2012) and Danjuma & Adeleye, 2015).

The findings in respect of hypothesis 3 (Table 7) revealed significantly low positive relationship between level of school facilities maintenance efficiency and students' academic performance in Adamawa State Senior Secondary Schools. Efficient school facilities maintenance according to Edward (2012) is a precondition for strong academic program and students' performance. This shows that prompt repairing of broken walls, chairs, tables and regular servicing of equipment as a proactive measure to sustain the life-span of school facilities are related to students' academic performance in Adamawa State. Uchendu, Ekanem and Jonah (2013) revealed that poor school facilities maintenance are indicated by either poor physical appearance, untidy walls, leaking roofs, overgrown compounds etc of a school, which suggests that education within the buildings follow the same pattern. The finding is consistent with Liar (2003) and Odigwe and Eluwa (2013) findings, that revealed a positive relationship between school facilities maintenance and students' academic performance.

Recommendation

The following recommendations based on the findings of the study and their implications are made:

1. Appropriate and efficient procedures for allocating school facilities to Senior Secondary Schools should be developed by the planning division of the Ministry of Education and it should be followed strictly when allocating school facilities;
2. School principals should frequently carry out comprehensive assessment of the facilities in their schools to determine areas of need. This type of assessment will assist the planning division of Ministry of Education in policy formulation as it relates to facility management in Senior Secondary Schools;
3. School principals should encourage teachers to improvise teaching aids not supplied by government to improve academic performance among the students in their respective schools;
4. All Senior Secondary Schools to start income-generating activities and form organizations for old students to help raise funds to subsidize the government funding.
5. Senior Secondary Schools in Adamawa State should be provided with functional libraries, equipped with current reading materials to help enhance both the students' academic performance and the teachers' effectiveness in academic activities in the school.

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Factors Influencing Labor Turnover Intention.

A study on Qatar based Sri Lankan Industrial Labors

PT. Mohamed Niyas,

Universal Business and Technology Campus, Sri Lanka
Tel:+94777310992 E-mail: mnyas0123@gmail.com

M.Siraji

Hardy Advanced Technological Institute, Sri Lanka
Tel:+94776704611 E-mail: sirajim@hardyati.edu.lk

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Abstract

The general aim of this project is to evaluate the factors that influence labor turnover within the Qatar, with a focus placed on Sri Lanka. Using a structured questionnaire, a total of 277 valid responses have been collected from June to July 2017. The Structure Equation Modelling (SEM) has been used to analyse the influencing factors on labour turn over. The findings show that structural path model closely fits to the sample data, indicating better employment opportunities is highly influencing factor on labour turn over and the relationship between the management and employees is only significant negative influence on labour turn over. The findings of the study have significant implication for Sri Lankan recruitment agencies and Qatar industry stakeholders, especially those responsible for managing human resources. It is recommended that if Sri Lanka bureau of foreign employment and Qatar companies are aware about the factors, they can manage their human resource management issue.

Keywords

Labour Turnover, Working Environment, Poor Remuneration Packages, Relationship between the Management and Employees, Inadequate Career Progression, Better Employment Opportunities

1. Introduction

Qatar has been one of the major recipients of over 88% of the Sri Lankan migrants who are seeking employment opportunities abroad (Sri Lankan Bureau of Foreign employment, 2015). Over the last few years the trend of Sri Lankan migrants to Qatar for lower cadre jobs has increased. As a result, the government of Sri Lanka through the Ministry of Foreign Employment has put in mechanisms to increase its supply of migrant skilled labor for many skilled and professional categories of workers who have a higher income capacity than most of the lower cadre jobs that the country has been supplying (SLBFE, 2015).

However, the Qatar labor market has become highly competitive with a host of other countries entering its labor market afresh bringing more trained and qualified workers that have proved to fit quickly into the current demands in the Qatar labor market (SLBFE, 2015). Due to globalization worker mobility all over the world has tremendously increased. Most workers in the Middle East and other Arab countries have been increasingly seeking job opportunities in Qatar. However, the entry of many African countries like Kenya and Nigeria among others have contributed to this rapid exploitation of this opportunity leading a decline in the number of Sri Lankans being absorbed in the Qatari labor market.

In 2013, Qatar ranked second worldwide in terms of GDP, boasting a GDP of approximately \$100,000 per annum (Demography, Migration and Labor Market in Qatar, 2014). This was attributed to high hydrocarbon endowments consisting of large natural gas and sizable oil reserves that are highly valued natural resources over time. Qatar is the smallest state in the GCC with a low population and this contributes to the high level of wealth per person recorded as above (Demography, Migration and Labor Market in Qatar, 2014). The population growth in Qatar has been fairly low even with naturalization of some Iranian and other Arab Middle East residents, the population was still low. The oil rent provided the Qataris with high standards of living with improved healthcare,

security, housing and subsidized utilities and education. According to Human Development Ranking report 2013, Qatar emerged at the top in the Arab region and 36th in the world.

However, the need to modernize Qatar’s institutions as well as infrastructural upgrading to world-class standards requires a high number of foreign workforces which is more than it cannot be replaced by the few Qatari nationals. This imbalance brought about the huge demand for labor in this natural gas and oil resource endowed country (Demography, Migration and Labor Market in Qatar, 2014). Qatar’s population growth is growing steadily but interestingly, the foreign nationals form the majority of the residents.

Qatar has enjoyed a spectacular growth in the economy from the year 2000 hence the need to import foreign workers more especially male laborers from many parts of the world. Many Sri Lankans have joined this labor market through this initiative. The Qatari labor market is dominated by the foreign workers. By 2013, out of a labor force of 1,543,265 people, 1,450,703 workers, representing 94% of this workforce is composed of foreign nationals (Demography, Migration and Labor Market in Qatar, 2014). In the 94% workforce comprising foreign workers, male workers dominate with a ratio of 1 female after every 8 male workers. Qatar has a high employment rate of 94.1% of its population which is higher than any other state in the GCC. 80.6% of employed Qataris work in the public sector and 78.4% of foreign workers are absorbed by the private sector (Demography, Migration and Labor Market in Qatar, 2014; Qatar Labor Force Survey, 2013).

The numeric domination of non-Qatari workers is reflected in every occupation level with 80% of all managers and 99% of unskilled labor positions. However, many Sri Lankans are clustered in the lower cadre positions as compared to many other non-Qatari workers. Among the employed Qatar citizens, 80% of them are in “white collar” positions ranging from senior managers to clerks (Demography, Migration and Labor Market in Qatar, 2014; Qatar Labor Force Survey, 2013).

It appears that different nationalities have a tendency to lie in certain occupations. For instance the lowly educated Nepalese and Bangladeshis population are clustered in lower cadre of occupations with less income. Nearly half of the Arab nationals are in skilled and highly skilled occupations that are well paying. Indians form the majority of more than 17% of them being expatriates with a diversity of skill levels as well as occupation profiles (Demography, Migration and Labor Market in Qatar, 2014; Qatar Labor Force Survey, 2013). . Most Sri Lankans are in the lower cadre occupations but as more of the Sri Lankan population is getting more educated, they are climbing up the occupation as well as the income ladder (Sri Lankan Ministry of Foreign employment, 2015). Qatar is still a preferred destination for workers seeking for employment opportunities abroad and continues to attract large populations from all over the world. The majority of those seeking employment in this oil and natural gas rich country are from the Asian continent including Sri Lanka, Middle East Countries and now Africa. The levels of employment in these developing countries are very low increasing the appetite for the search of job opportunities in Qatar.

The hype that was experienced in taking up jobs in Qatar has been gradually diminishing with some of the workers opting out of this foreign labor hub. This research therefore seeks to identify the factors contributing to high labor turnover in Qatar with emphasis on Sri Lankan workers. Labor turnover has become a major issue in Qatar with a high number of those employed shifting from one occupation to the other and others completely going back to their countries. According to the Sri Lanka Bureau of Foreign Employment 2015, the number of requests for replacement of workers in Qatar has been rising steadily. More people who had travelled abroad have changed their minds due to a number of reasons prefer to look for job opportunities elsewhere. This study therefore seeks to find out some of the contributing factors for the high labor turnover that has hit the state of Qatar.

The present working environment all over the world has been greatly revolutionized giving special concern to the needs of the employees. Employees are now considered the most valuable assets that an organization can have (Hom, Mitchell, Lee & Griffeth, 2012). However, this seems to have not had an impact in most Qatari organizations leading to this unusual situation from a country that well-endowed and has capacity for even more workers. An analysis of the departures and the respective returns of workers from abroad show a disturbing trend with increasing high numbers of returns being recorded from 2011 to 2015 as shown in figure below. According to the report by Sri Lanka Bureau of Foreign Employment 2015, the percentage of return throughout the period under review has been higher for females indicating the conditions of work have been all that favorable to the female workers as shown in figure below:

	Male				Female			
	Departure		Return		Departure		Return	
	No	%	No	%	No	%	No	%
2011	136,307	51.84	13,630	10	126,654	48.16	18,998	15
2012	144,135	51.03	17,296	12	138,312	48.97	24,896	18
2013	175,185	59.75	19,270	11	118,033	40.25	23,607	20
2014	190,217	63.26	28,553	15	110,486	36.74	19,887	18

2015	172,630	65.56	27,621	16	90,677	34.44	19,042	21
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Source: Sri Lanka Bureau of Foreign Employment, 2016.

This research will therefore seek to establish the main causes of the high worker turnover rate that has been recorded from Qatar. This will contribute to the existing body of literature that if adopted will reduce the higher turnover rates that are being recorded currently.

1.1 Research Questions

The research questions help to analyze the problems of the research and find the best solution and help in reaching the appropriate conclusion. Following are the research questions that researcher has made:

1. Do the factors associate with labor turnover intention rate in Qatar?
2. What are the factors influencing labor turnover intention rate in Qatar?
3. What extent do the factors influence on labor turnover intention in Qatar?

1.2 Research Objectives

The core objective of the present study is to assess the factors that influence the labor turnover rate in the Qatar based on Sri Lankan industrial labors. The researcher would like to research the following secondary objectives:

1. To identify the association between factors influencing labor turnover intention in Qatar.
2. To identify what are the factors influencing labor turnover intention in Qatar.
3. To what extent the factors influence on Labor turnover.

1.3 Significance of the Study

The present research is quite significant to know the basic reason for labor's turnover rate in Qatar, especially of the Sri Lankan labors who do not only provide advantages to the Middle East economy, however, they also add benefit to the Sri Lankan foreign exchange as well. The male and females both Sri Lankan labors was departure in the Qatar, however, the ratio of female turnover rate is higher than the male. The migration of the women for employment in Middle East remained slows from 1995 to 2015, and it was greatly declined to 34 % in 2015. It is necessary to know the reasons behind this huge swing.

The major Qatar, Qatar, Kuwait, UAE and Saudi Arabia were receiving the highest labor that captured about 84 % of the Sri Lankan labor. But now, these countries are suffering from the labor turnover issues and this problem is increasing continuously during the past five years and is unable to reduce because they do not have found proper reasons behind this issue (Bawa, & Jantan, 2005).

The present research is concerned to highlight all the major issues and factors that are increasing the labor turnover rate in Qatar. It is also necessary to analyze the huge swing in the decreasing departure rate of Sri Lankan's labor and the rate of their return to the Sri Lanka. The Sri Lankan labor provides main contribution to the Middle East labor market, especially in the private companies. Therefore, all the Qatar are greatly disturbed by this increasing labor turnover issues and they require evaluating the factors that become a major reason behind all this issue.

2. Literature Review

The concept of labor turnover has been studied by many researchers and it is used interchangeably with employee turnover which refers to the rate at which workers leave an organization (Akinyomi, 2016). The concept of labor turnover has been largely used in the business sector. Mainly, employee turnover is the net result of the employees' exit and the entrance of the other new employee to the organization. Kazi & Zedah, (2011) viewed employee turnover as a common movement of workers in labor market form one organization to the other, due to change of career or profession or from being employed to staying without a job either voluntarily or being compelled by any reason from the organization. Employee turnover has become a common problem in the current business environment due to its unfavorable consequences to the businesses as well as the workers involved. Therefore companies ought to put in place mechanisms to control the labor turnover as they control costs as well. As far as employee turnover is common both in the public and private sector, Shamsuzzoha & Shumon, 2010 in Akinyomi, (2016) observe that it is more rampant in privately owned enterprises.

Rajan (2013) categorizes labor turnover into five groups based on the nature of the turnover. A) Functional and dysfunctional turnover. According to Rajan (2013) functional turnover results workers exhibiting poor performance and hence their engagement is terminated by the organization. Dysfunctional turnover results when employees decide to leave the organization despite having performed excellently. B) Voluntary and involuntary turnover. Voluntary turnover results when employees make a choice of quitting for themselves due to a varied number of reasons. Involuntary turnover results when the worker is compelled by the organization to leave. In this case, the employee has no choice but to leave.C) Skilled and unskilled turnover. This refers to low cadre jobs that require unskilled or uneducated employees. The turnover is high and replacement is easier. Skilled turnover occurs when highly educated, skilled and trained employees leave the organization. The exit of such employees from an organization creates some

substantial risk in the organization and replacement is not always easy. D) Avoidable and unavoidable turnover. A voidable turnover is the one that occurs under avoidable circumstances whereas a turnover occurring under unavoidable circumstances is referred to as unavoidable turnover. E) Internal and external turnover. Internal turnover results as employees move from one position or department to the other within the same organization. External turnover involves movement from one organization to the other. It is the most commonly featured labor turnover.

It will be prudent that I include the damning report dubbed The Dark Side of Migration by Amnesty International, 2013 that was compiled after a series of interviews with the people working in Qatar. The findings of this research put Qatar’s Construction Sector on the spot on breaching employment contracts and treating the workers unfairly. Amnesty international is an internationally recognize institution that deals with human rights. In 2013, it moved top Qatar in response to increasing outcry from the construction workers who were taken to put up and refurbish many sporting facilities and other related structures in preparation for the 2022 world games that will be held in Qatar.

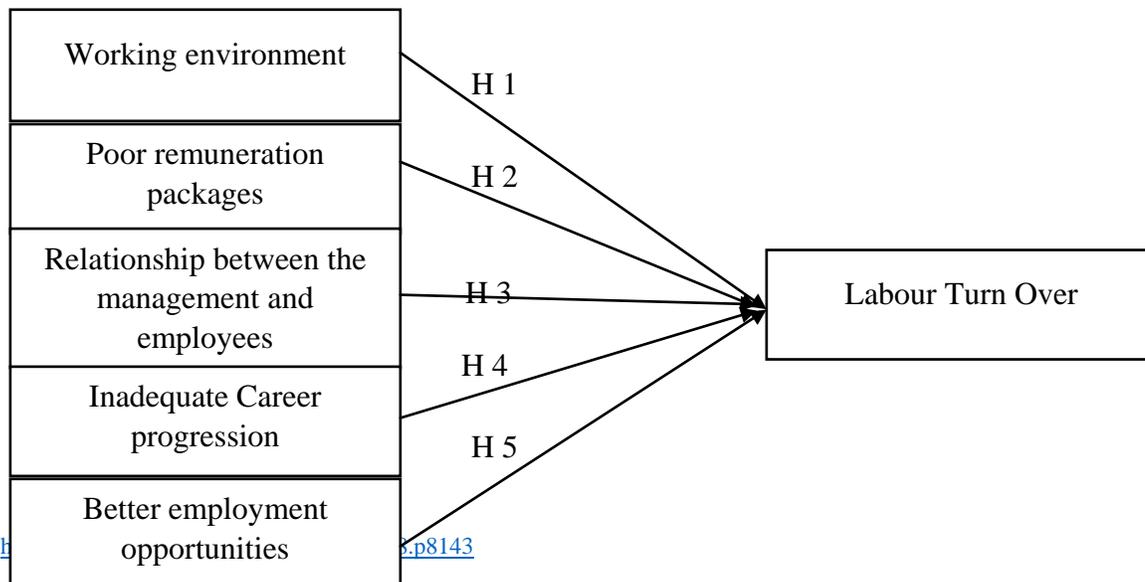
Many people who had fallen victim had written to the Amnesty International asking them to intervene in the otherwise worsening situation for laborers who were recruited in various construction sites in Qatar. Workers who were interviewed by Amnesty International gave accounts of exploitation practices that they were facing, their travel documents were confiscated by their employers, the terms of engagement that they had signed were changed to their disadvantage without involving them, they do total different work from what they were recruited for and the delays in paying them. These findings were consistent with another quantitative study that had been done earlier whose findings alluded to the same humiliating practices.

The interviews with some employers in Qatar reveal that they confessed to have been engaging in practices that are against the Qatari labor laws like delaying payment of the workers even for several months and frustrating their efforts to go back to their countries. Interviews with the embassies of the countries that have their citizens working in Qatar revealed that exploitation was rife and the avenues for the workers to get justice have been ineffective. The many cases involving exploitation that caught the attention of Amnesty International, these inhuman acts were note feted against them by the failures of one employer; exploitation was cited to a systematic problem in the management of the migrant workers in Qatar. Amnesty international observed that many workers were facing severe exploitation but for many months. Despite seeking for reprieve from many authorities, they have not been assisted adequately.

3. Research Methodology

The conceptual framework for the study was developed from the literature review by highlighting the factors that influencing labor turnover intention in State of Qatar based on Sri Lankan Industrial Labors. The schematic diagram of the conceptual model is developed in figure 1 where the five elements that formed the basis of the study as influencing the process of labor turnover were summarized. The rate of employee turnover therefore forms the dependent variable for the study. This is because based on the attitude and behaviors of an employee that are influenced by what they see within their company in terms of the prevalent environmental working conditions (either poor or good), the monetary and financial rewards or compensations offered to the individual employee, relationship existing between managers and the employees, inadequate career progression, and the amount of opportunities offered within the occupation., they may choose to stay with the organization for a little longer or gain a mind of lifetime organizational loyalty or level.

Conceptual Framework



Source: Author, Conceptual Framework for the study

3.1 Research Approach and Design

This study adopt a cross-sectional design to explore the Sri Lanka Industrial labor in Middle East country. The first approach is the survey design. According to Mugenda and Mugenda (1999), this format of research seeks to gain information from the members of a given population. This type of research explores and describes existing phenomena by getting one-on-one views from individuals based on their opinions, attitudes and reactions. Data gathered from the survey questionnaires was combined and compared with collected quantitative data. The questionnaires was sent to industrial labors whose names and addresses are accessed through their Sri Lanka Bureau of Foreign Employment.

4. Data Presentation and Analysis

4.1 Delivery and Response Rate

Questionnaire for this study was distributed to the respective Individual Sri Lankan industrial labour who are already registered in Sri Lanka Bureau of Foreign Employment (SLBFE). The researcher personally visited SLBFE got concern to distribute the questionnaire to individual who returned from Qatar within three month period and follow them via phone call to forward online survey web link and printed self-stamped addressed envelope or asked them to fax it to the respondents or via email since researcher confronted difficulties in obtaining the names and email addresses of Individual. Further, respondents were also given options either to reply by mail/e-mail or fax, whichever convenience for them. Follow up via phone call after two weeks from the initial distribution of the questionnaire is made to brokers to ensure that the questionnaire is being entertained accordingly. The survey administration takes two months approximately, from June 2016 to July 2017. All in all, 385 Questionnaires were administered to labour, (received questionnaire)277 Individual responses were completed and returned, yielding a usable rate of 72%, which is quite high in comparison with other similar studies (Anastasios et al., 2014). The descriptive analyses of the survey responses are discussed under the following sub-headings. The classifications of demographic variable were in line with Anastasios et al., 2014).

Demography Characteristics of the Respondents Table 4.1 summarises the respondent’s demographic characteristics, The result shows that male respondents accounted for 205 (74%) of the respondents whereas 72(26%) of the respondents were female.. Ages 21-30 (46%) account for the biggest portion of the sample, followed by ages less than 18-20(20%), ages 31–40 (16%), ages 41-50 (17%) and ages over 50 (1%).Marital status, 196 (71%) were married and 68 (24%) of the respondents were single, 13 (5%) were divorced, and none of the respondents have fallen under the category of others. Respondents with high school and lower qualification was held by 108 (39.0%), followed by diploma 88 (31.8%), bachelor degree 58 (20.9%), master 14 (5.1%) and others 09(3.2%). A total of 199 (71%) respondents was held entry level employment, middle level 67 (25%) and upper level 11 (4%).

Table 4.1 Summary of respondents characteristics (n= 277)

Variable	Investor grouping	Frequency	Percentage	CF
Gender	Male	205	74	74
	Female	72	26	100
Age (years)	18-20	30	20	20
	21-30	129	46	66
	31-40	50	16	82
	41-50	48	17	99
	>50	01	01	100
Marital Status	Single	68	24	24

	Marital	196	71	95
	Divorced	13	05	100
Employment Level	Entry Level	199	71	71
	Middle Level	67	25	96
	Upper Level	11	04	100

4.2. Descriptive statistics for independent and dependent variable

Descriptive statistics such as maximum, minimum, means, standard deviation, Skewness and kurtosis were obtained for the interval scaled independent and dependent variable in this study. The results are show below table in 4.2, it may be mentioned that all variable were tapped on a five pint Likert scale. Respondents were requested to rate Items on a five point Likert-type scale ranging from 1 “Strongly Agree” to 5 “Strongly Disagree”.

Table 4.2 shows how respondents rated various items of the influencing factors and Labour Turn Over scale (LTO), and the results show that the Sri Lankan labour at Qatar exhibit the factor of Working Environment (WE) , Poor Remuneration Packages (PRP) , Relationship between the Management and Employees (RME, Inadequate Career Progression (ICP), and Better Employment Opportunities (BEO). The variables scores were determined by getting the average of the scores from the questionnaire for each one these indicators of investor behavior for each investor in the sample as shown in Table 4.2

Table 4.2: Descriptive statistics for independent and dependent variable

Variable	N	Min	Max	Mean	S.D	Skewness		Kurtosis	
						Stat	SE	Stat	SE
LTO	277	1.14	5.00	3.492	.881	-.243	.146	-.672	.292
WE	277	1.00	4.67	3.298	.805	.353	.146	-.642	.292
PRP	277	1.00	4.75	3.181	.761	.519	.146	-.187	.292
RME	277	1.20	4.60	2.575	.833	.427	.146	-.626	.292
ICP	277	1.40	5.00	3.696	.821	-.633	.146	-.523	.292
BEO	277	1.75	4.75	3.740	.782	-.830	.146	.015	.292

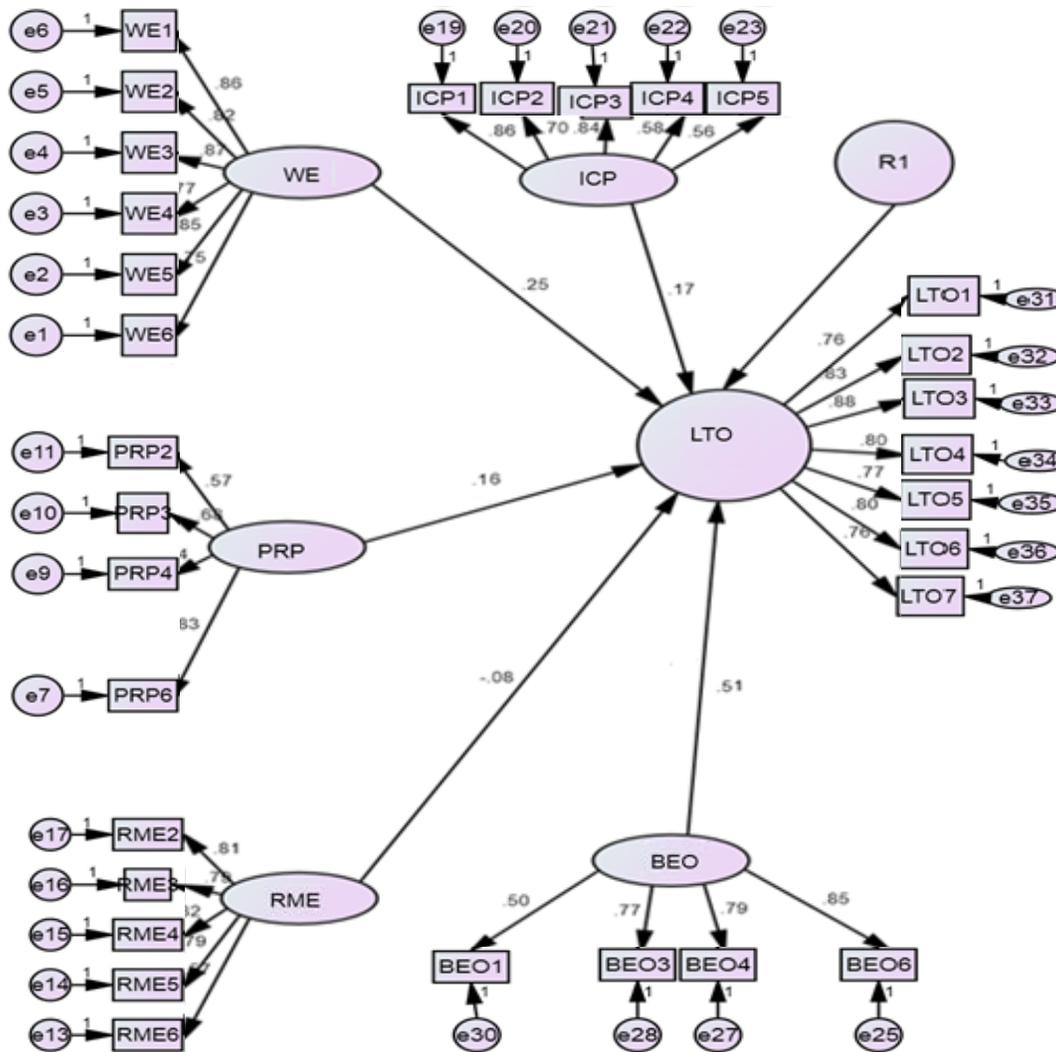
Note: Turn Over scale (LTO), Working Environment (WE), Poor remuneration packages (PRP) Relationship between the Management and Employees (RME), Inadequate Career Progression (ICP), and Better Employment Opportunities (BEO).

From the result, it may be seen that mean on RME variable is rather low (2.575), as the mean on PRP (3.181). WE is about average (3.298), and the ICP enriched (3.696). The mean of 3.74 for BEO indicates that highest mean of the variables. The minimum of 1 indicates that there are some who do not intend to leave at all, and the maximum of 5 indicates that some are seriously considering leaving.

4.3 Hypothesis Testing

The influence of influencing factors (Working Environment, Poor remuneration packages, Relationship between the Management and Employees, Inadequate Career Progression and Better employment opportunities) on labour turnover was examined using Structural Equation Modeling (SEM). The hypothesized model is presented in figure 4.2.

Figure 4.2: The hypothesized model-the influence of influencing factors in labour turnover.



As can be seen in Figure 4.2, the hypothesized structural model represented good fit to the current data. The fit statistics, CMIN/DF= 3.003; RMSEA = 0.085; RMR = 0.189; GFI = 0.786; TLI = 0.822) were all indicative of a good fit. The explanatory power of the research model was shown in Figure 5.3 in which the model of behavioral intention and attitudes account for 44.6% and 53.1% of variance (R²), respectively. All these statistics showed that the model does a good job of explaining the current data.

Table 4.8 Results of the hypothesized model using SEM

Unstandardized solution		Estimate	S.E.	C.R.	P	Standardized solution.	Hypothesis Results
						Estimate	Supported
LTO	← Working Environment (H1)	.257	.066	3.893	***	.250	Supported
LTO	← Poor Remuneration Packages (H2)	.154	.061	1.893	.007	.158	Supported
LTO	← Relationship	-.074	.059	-1.240	.012	-.079	Supported

LTO	←	between the Management and Employees (H3) Inadequate Career Progression (H3) Better Employment Opportunities (OC)	.126	.047	2.707	.007	.174	Supported
LTO	←	Opportunities (OC)	.504	.066	1.588	.002	.508	Supported

Note: Path significance: *** $p < 0.001$; ** $p < .01$; * $p < .05$.

LTO: labour turnover S.E: Standard Error. C.R.: critical ratio ($> \pm 1.96$ for a regression weight)

The results of the structural equation model of influencing factors in labour turnover are presented in table 4. It shows that Better employment opportunities has greatest significant positive relationship on labour turnover ($\beta = .504$, CR = 1.588, $p < .05$). In similar vein, Working Environment was also statically significant positive relationship on labour turnover ($\beta = .257$, CR. = 3.893, $p < .001$). And also Poor remuneration packages ($\beta = .154$, CR. = 1.893, $p < .01$) and Inadequate Career Progression have ($\beta = .126$, CR. = 2.707, $p < .01$) positively relationship on labour turnover. Of the five behavioral factors, only Relationship between the Management and Employees effects was negative relationship on labour turnover ($\beta = -.074$, CR. -1.240 =, $p < .05$).

Based on the standardized Beta coefficients, the effect better employment opportunities is 0.508, which is about more than 2 times (0.508/0.250 ~ 2) higher than the effect of working environment. Meanwhile, the effect of Better employment opportunities is more than 3 times (0.508/0.158 ~ 3) higher than the effect of Poor remuneration packages. Whereas, the effect of Better employment opportunities is more than 6 times (0.508/0.079 ~ 6) higher than the effect of Relationship between the Management and Employees and more than 3 times (0.508/0.174 ~ 3) higher than the effect of Inadequate Career Progression. Hence, better employment opportunities was most significant predictor for labour turnover ($p < .05$).

Furthermore, the effect working environment is 0.25, which is almost close to 1.5 times (0.25 / .158 ~ 1.5) higher than the effect of Poor remuneration packages. Similarly, the effect of working environment is less than 1.5 times (0.25 / .174 ~ 1.5) which is higher than the effect of Inadequate Career Progression. Whereas the effect of working environment is more than 3 times (0.25 / .079 ~ 1.5) higher than the effect of Relationship between the Management and employees . Hence, working environment also was a significant predictor for labour turnover ($p < .001$).

Moreover, the effect Inadequate Career Progression is 0.174, which is about more than 2 times (0.174 / .079 ~ 2) higher than the effect of Relationship between the management and employees. Meanwhile the effect of Inadequate Career Progression is more than 1.1 times (0.174 / .158 ~ 1.1) higher than the effect of Poor remuneration packages. Whereas the effect of poor remuneration packages and Relationship between the Management and Employees are lower than the effect of working environment, better employment opportunities and Inadequate Career Progression. Hence, Inadequate Career Progression also a significantly predictor for labour turnover ($p < .05$).

All in all, the Better employment opportunities is the most influential factor on labour turnover followed by working environment and Inadequate Career Progression. However Poor remuneration packages and Relationship between the Management and Employees have less influence factor compared to the Better employment opportunities, working environment and Inadequate Career Progression.

4.4 Results of Hypothesis Testing and Discussion

Structural Equation model (SEM) was used to analyze the data and to test the hypothesized relationships between the study variables. SEM is used to explore the predictive ability of a set of independent variables on one dependent measure. The justification for the use of SEM in this study was based on the fact that in the hypothesized relationships, multiple predictors were considered to have predictive ability on a single dependent measure. Since the aim of this study was to predict the relationships between a dependent variable and one or multiple independent variables using a structural equation model, standardized and unstandardized regression coefficients were used. The study was based on the premise that influencing factors and labour turnover.

4.5 Relationship between influencing factors and labour turnover

The second and third objectives of the study were to identify and find extend of influencing factors on labour turnover at Qatar based on Sri Lankan industrial labour. Structural Equation model was used to test the hypothesized relationship. Investor

behavior factors was identified into Working environment, Poor remuneration packages, Relationship between the Management and employees, Inadequate Career Progression and better employment opportunities. All five Hypothesis was stated as follows:

Hypothesis 1: There is a significant influence of working environment and labour turnover at Qatar based on Sri Lankan industrial labour.

The results of the structural equation model of working environment and labour turnover are presented in table 4.8 It shows that working environment was statically significant and positively related to individual labour turnover ($\beta = .250$, $CR = 3.893$, $p < .001$).

Hypothesis 2: There is a significant influence of Poor remuneration packages and labour turnover at Qatar.

The results of the structural equation model of Poor remuneration packages in labour turnover are presented in table 4.8 show that Poor remuneration packages was statically significant and positively related to labour turnover ($\beta = .250$, $CR = 3.893$, $p < .001$).

Hypothesis 3: There is a significant influence of Relationship between the Management and Employees effect and labour turnover at Qatar.

The results of the structural equation model of Relationship between the Management and Employees effect in stock labour turnover are presented in table 4.8 show that Relationship between the Management and Employees effect was statically significant and positively related to labour turnover ($\beta = .079$, $CR = -1.240$, $p < .05$).

Hypothesis 4: There is a significant influence of Inadequate Career Progression and labour turnover at Qatar.

The results of the structural equation model of Inadequate Career Progression in labour turnover are presented in table 4.8 show that Inadequate Career Progression was statically significant and positively related to labour turnover ($\beta = .174$, $CR = 2.707$, $p < .01$).

Hypothesis 5: There is a significant influence of Inadequate Career Progression and labour turnover at Qatar.

The results of the structural equation model of Better employment opportunities in labour turnover are presented in table 4.8 show that over was statically significant and positively related to labour turnover. ($\beta = .508$, $CR = 1.588$, $p < .05$). All in all structural regression coefficients presented in the model were statistically significant. This implies that all hypotheses tested were supported by empirical data collected. In the other words, it states that better employment opportunities, Poor remuneration packages, Inadequate Career Progression has positively influence in stock investment decision of individual labour, as well as Relationship between the Management and Employees has negatively influence the individual labour turnover.

5. Conclusion

The study examined the influence of working environment, poor remuneration packages, relationship between the management and employees, inadequate career progression and better employment opportunities with the labour turnover of Sri Lankan migrant industrial employees in Qatar. In spite of the excess of evidence, which in many cases is somewhat subjective in nature, the study tests some conventional norms, particularly within the Sri Lankan Industrial labour who worked in Qatar. The application of structural equation modeling enabled the researcher to gain an in depth holistic perspective of the causal linkages of the above-mentioned constructs within the Sri Lankan industrial labour migrate to Qatar.

While searching through the literature it was evident that many of the previous studies restated the word that better employment opportunities of labour demonstrate high levels labor turnover intention among other factors and likely to quit their organization. The findings supported the hypotheses that there is a positive significant ($p < 0.05$) influence of better employment opportunities on labour turn over, also supporting the work of Liyanage & Galhena, (2012). This evidence suggests that organizations concerned about better employment opportunities should investigate policies and practices and company's internal environment should provide better opportunity to the employees what other similar companies have, further involve those at the 'coal-face' including information sharing, decision-making and empowerment initiatives which can win 'hearts and minds'. Anecdotal evidence would suggest that this is rarely the norm, where the tendency is for top-down command and control organizational structures and practices (Zopiatis & Constanti, 2007).

When investigating the causal relationships between working environment and labour turnover, a significant ($p < 0.001$) association was revealed only with the later. It seems that working environment influence the labour turn over. The current study's findings support other similar studies (Shamsussoha & Shumon, 2010 and Shukla & Sinha, 2013) despite the fact that working environment was measured as a single construct by other researchers. Subsequently, the researcher investigate relationship between the management and employees on labour turn over separately and we found that there is a negative significant ($p < 0.05$) influence of relationship between the management and employees on labour turn over and this finding similarities with other studies (Shukla & Sinha, 2013) which found that relationship between the management and employees leads to labour turn over and negatively influence.

Researchers have called for additional investigations into the poor remuneration packages with turnover intention (Shukla & Sinha 2013 and Akinyomi, 2016). In accordance with Shukla & Sinha (2013) findings, our data revealed a significant ($p < 0.01$) positive association between poor remuneration packages and labour turnover.

Further, the study investigated the influence of job inadequate career progression and labour turnover. The study which claim a significant ($p < 0.05$) positive influence between the two constructs and the finding similar with other researcher finding (Liyana & Galhena 2012). In environments challenged with issues such as working environment, poor remuneration packages, relationship between the management and employees and inadequate career progression, better employment opportunities most often obscured by the more 'materialistic' factor which seem to have a determining role influencing labour turnover. Findings revealed a significant negative influence only between labour turn over and relationship between the management and employees, while other factors had a positive influence. Sri Lankan characteristics as a migrant labour may serve to clarify understanding as to why this is the case. The nature of the migrant labour in Qatar's industry has been accompanied by a decrease in core, and the increase and greater reliance on peripheral staff. Consequently, employees are less loyal, while employers' obsession with cost reduction and short-termism reduces their motivation to invest in training and development of the workforce, whether core or peripheral in nature (Baum & Lundtorp, 2000; Conlin & Baum, 2003; Adler & Adler, 2004; Baum et al., 2007; Shakeela & Cooper, 2009).

In addition, Baum's (2012) articulate critique of 'ad hocism' in most migrant labour in Middle East enterprises' human resource management practices can also inform the discourse. This apathetic approach to managing people is likely to culminate in the squandering of an island's human capital with far reaching consequences, particularly where economic development is dependent on the foreign employment.

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Influence of Topography and Management Practices on Nitrogen Content of Soils Formed in Biotite-Granite Parent Material on the Jos Plateau, Nigeria.

BY

Galadima, J.S.¹, Olowolafe E.A.² And Laka, I.S.³

^{1,2,3}DEPT. OF GEOGRAPHY AND PLANNING, UNIVERSITY OF JOS. P.M.B.2084, JOS)
joshuagaladima66@gmail.com

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ABSTRACT

Nitrogen is a macro nutrient that is essential to crop growth and production. One of the major constraints to sustainable crop production on the Jos Plateau is soil fertility. The availability of nitrogen and other essential plant nutrients in the soil is a key indicator of soil fertility. The content of nitrogen in soils is affected by a number of factors such as drainage, texture and slope steepness. This study was conducted on one of the important parent materials on the Jos Plateau, biotite-granite, taking into account the influence of topography and management practices by farmers. The result showed that the nitrogen content of the soils were quite low. The surface soils had a range of 0.021-0.140% with mean of 0.065%. The slope facets had means of 0.058%, 0.042%, 0.069% and 0.103% respectively for the upper foot slope, middle foot slope, lower foot slope and depression. The higher content of nitrogen in the depression was strongly correlated ($r = 0.694$) with organic matter. The result for the profile pits revealed that soils in the upper foot slope and depression had higher contents at the surface (0.105% and 0.140%) while the middle foot slope had the lowest. The profile pits with and without application of burnt municipal waste had 0.150% and 0.090% respectively at the surface. T-test gave a value of 0.001 for nitrogen 0.01 to 0.001 for other soil properties indicating strong differences in the means

for the two treatments. Crop rotation, planting of cover crops and mixed farming were suggested as management practices that could be used to increase nitrogen content of the soils.

Key words: Nitrogen, biotite-granite, Jos Plateau, soil fertility

INTRODUCTION

It has been observed that one of the major constraints to sustainable crop production on the Jos Plateau in Nigeria is low soil fertility (Olowolafe et al, 2007). The availability of the essential macro and micro nutrients in the soils are key indicators of soil fertility. Nitrogen is regarded as an essential nutrient for crop production because of its influence on plant growth, reproduction and general health of plants. The USDA-NRCS have stated that nitrogen is the most abundant element in the atmosphere and usually the most limiting nutrient in crop production. The truth of this statement is most strongly expressed in the tropical environment. The addition of nitrogen to the soil comes via the atmosphere through rainfall, organic matter, left over from previous crops grown through N fixation and addition from inorganic fertilizer. Wetselaar et al (1981) have observed that the losses of nitrogen from the soil system are partly due to the direct or indirect result of microbial activities which in the tropical environment is, to a certain limit, accelerated by high temperatures.

The nitrogen content of soils is affected by a number of factors including soil drainage, soil texture and slope steepness which impact N transport and transformation and which can limit the availability of the nutrient to crops (USDA-NRCS). Soil texture on the Jos Plateau is predominantly sandy (Galadima, 2018) and this makes the soils susceptible to N losses through leaching as water can quickly pass through the soil system taking the nitrogen out of the root zone and beyond the reach of plants. The objective of this paper is to analyse the content of nitrogen in soils formed on biotite-granite parent materials and

suggest possible management practices that will ensure the availability of the nutrient for sustainable crop production.

STUDY AREA.

The Jos Plateau lies between lat. $8^{\circ}30'N$ to $10^{\circ}30'N$ and long. $8^{\circ}20'E$ to $9^{\circ}30'E$ and has an average elevation of about 1,250m above mean sea level. It experiences the Aw climate (Koppen classification) with two distinct seasons. The raining season usually lasts between April and September while the dry season is from October to March. These two seasons are influenced by the Inter-Tropical Discontinuity (ITD) which brings the area under the influence of two very distinct air masses i.e. the tropical maritime and the tropical continental. They are characterised by warm moist and cold dry conditions respectively. Mean annual rainfall is 1,260mm with a single maxima occurring between July and August. The mean annual temperature is about $24^{\circ}C$. The Jos Plateau is located in the northern Guinea savanna vegetation zone characterised by tall grasses and open woodland. Human interference has greatly affected the original vegetation (Keay, 1953). The geological makeup of the area is comprised of Precambrian basement complex rocks (including migmatites, gneiss and older granites), the Jurassic younger granites (biotite-granite) and the Tertiary and Quaternary volcanic rocks (including basalts, pumice, lava flows and ash deposits) Macleod et al (1971). Olowolafe and Dung (2000) have stated that the varied geological and topographic features of the Jos Plateau have given rise to four major soil types in the area including Inceptisols, Entisols, Alfisols and Ultisols.

MATERIALS AND METHODS

The study was conducted exclusively in areas underlain by biotite-granite (younger granites) parent material which make up about 38% of the surface of the Jos Plateau. Soils were sampled on two sites using two criteria. On the first site soils were collected based on toposequence with samples collected

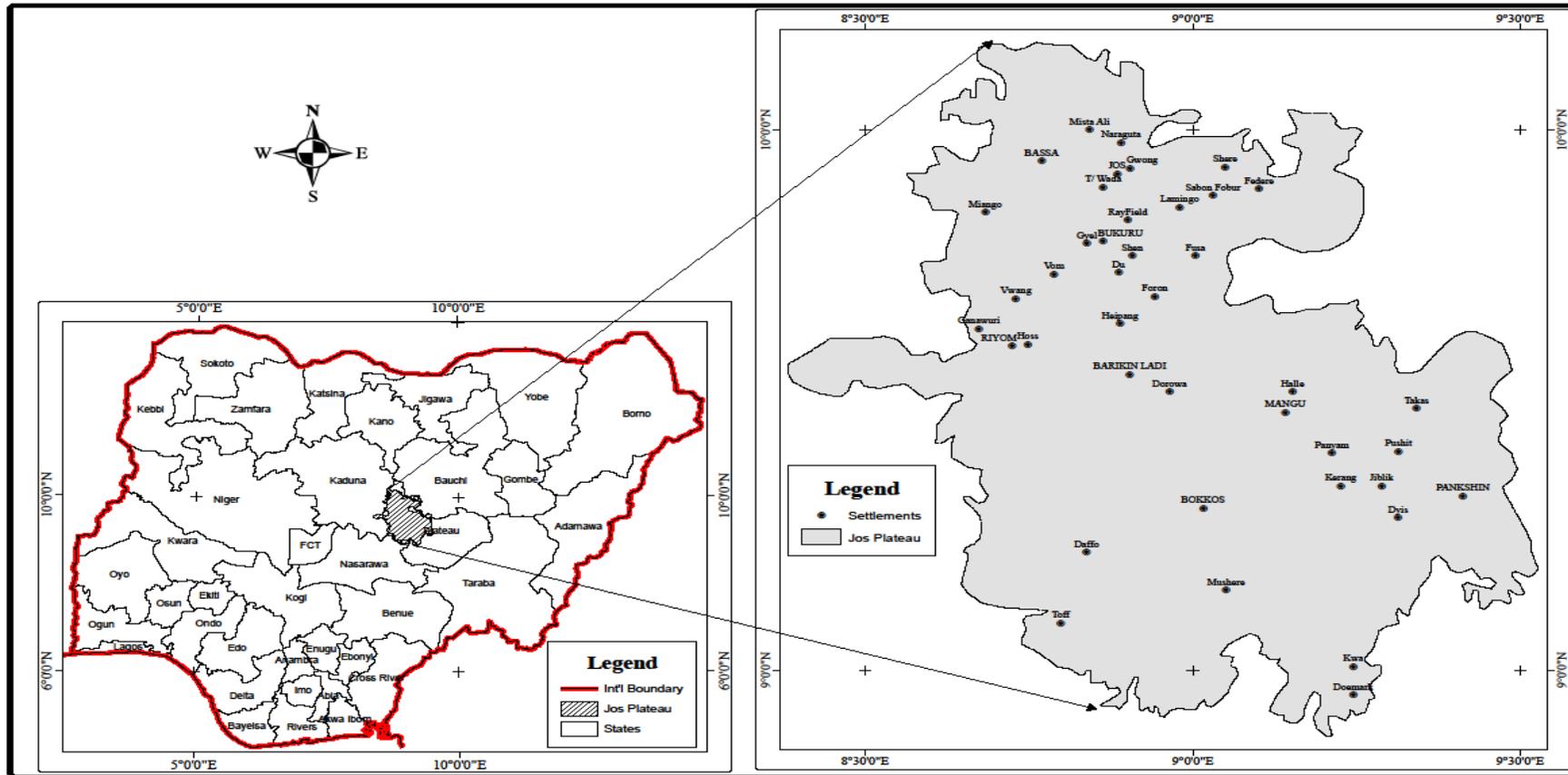


Figure 1: Jos Plateau, Nigeria

from the upper foot slope, lower foot slope and depression. On the second site a particular management practice that has been used for a long period of time was the criterion used. A total of 5 profile pits were dug to allow for an assessment of profile characteristics of the soils. Surface soil samples were also collected to show the trend in the distribution of nitrogen over the surface.

The hydrometer method was used in carrying out particle size analysis of the soil samples. This method was developed by Bouyoucos (1962). The method is based on the continuous reduction of the density of soil suspension. Measurement of pH was made on a 1:2.5 soil: water ratio using a glass electrode pH meter as described by Kalra (1995). Nitrogen was determined using the Kjeldahl method. The procedure involves digesting the sample in sulphuric acid and organic nitrogen is converted to ammonium sulphate. The solution is then made alkaline and NH_3 distilled. The evolved ammonia is trapped in boric acid and titrated with standard acid (0.01M HCl). The process recovers both organic and ammoniacal forms of nitrogen. The Walkley-Black method was used in organic carbon determination as described by Nelson and Sommers (1996). After the titration and organic matter determination, the percentage organic matter in soil was then calculated by multiplying the percentage organic carbon by 1.729. Cation exchange capacity was determined using the ammonium acetate (NH_4OAc) displacement method. Effective cation exchange capacity was obtained by summation of the exchangeable bases and exchangeable acidity while cation exchange capacity of the clay fraction was obtained by multiplying by 100 the ratio of ammonium acetate at pH 7 to percentage clay (Soil Survey Staff, 2010).

RESULTS AND DISCUSSION

The statistical data of analysis conducted on the surface soils are presented in table 1. The soils are dominated by sandy clay loam, sandy loam and

loamy sand. Percentage sand for all the topographic positions ranged between 36 to 90% with mean of between 45-64.5% for the different topographic positions but the appreciable percentages of clay and silt had an ameliorating effect on the sand content. This is significant because sandy soils are known to be vulnerable to high loss of nitrogen through leaching because of their low water and nutrient holding capacities (USDA-NRCS(b)). Values of soil pH for the surface soils reveal that they ranged between 3.60-6.74 and a mean of 5.05. Mean values for the different slope positions showed that the lower foot slope with 4.73 was the most acidic while the depression with 5.71 was least acidic. Thus the soils at the surface are very strongly acidic (USDA, 1993). The generally low pH values of the soils may be attributed to the acidic nature of the parent materials from which the soils are derived as well as the leaching of basic cations out of the soil profile (Olowolafe, 2003).

The organic matter content of the soils is very important in analyzing the nitrogen content due to the fact that it is a major source of the nutrient in soils. Data in table 1 show that the organic matter content of the soils ranged between 0.45-2.93 with mean of 1.39. However, there were serious variations in the content according to slope with the middle foot slope with 0.64 having the least while the depression with 2.33 having the highest. This could be attributed to down slope movement of materials and their accumulation in the depression as well as the higher moisture content which is known to reduce the rate of decomposition of organic materials. CEC content of the soils ranged between 3.80- 14.50 cmol/kg with a mean of 7.71cmol/kg. The lower foot slope had the least content with a mean of 6.15cmol/kg while the depression had 10.90cmol/kg. The CEC content of the soils is quite low according to Holland et al (1989) who have rated soils with CEC of 5-15 cmol/kg as low.

The nitrogen content of the surface soils ranged between 0.021-0.140 with mean of 0.068%. However, the different slope facets had varied content with 0.058, 0.042, 0.069 and 0.103% for the upper, middle, lower foot slopes and the depression respectively. The higher

Table1. Effect of topographic position on the soil properties

	Topography	Min.	Max.	Mean	St.Dv.
Clay	1	8	28	15.3	6.77
	2	10	28	19	12.73
	3	10	34	24.5	8.50
	4	20	29	24.3	4.51
Silt	1	2	36	20.2	12.59
	2	10	34	22	16.97
	3	4	34	20.5	12.23
	4	24	36	30.7	6.11
Sand	1	36	90	64.5	18.67
	2	38	80	59	29.70
	3	40	86	55	18.26
	4	44	47	45	1.73
pH	1	3.60	6.74	4.88	1.12
	2	5.00	6.11	5.56	0.78
	3	4.00	5.60	4.73	0.61
	4	5.50	5.84	5.71	0.19
OM	1	0.58	2.10	1.15	0.57
	2	0.60	0.67	0.64	0.05
	3	0.45	2.92	1.40	0.86
	4	2.11	2.46	2.33	0.19
TN	1	0.030	0.105	0.058	0.033
	2	0.035	0.049	0.042	0.010
	3	0.035	0.130	0.069	0.036
	4	0.070	0.140	0.103	0.035
CEC	1	3.80	12.40	7.18	3.52
	2	6.70	11.70	9.20	3.54
	3	4.38	9.20	6.15	2.08
	4	4.40	14.50	10.90	5.64

Topography: 1= Upper foot slope, 2= Middle foot slope, 3= Lower foot slope, 4= Depression

Table 2: Soil physical and chemical properties for profiles

	Horizon	Depth	Particle Size distribution(%)			Text. Class	pH	%		cmol/kg
			Clay	Silt	Sand		H ₂ O	OM	TN	CEC
Profile No.23 Upper Footslope Biotite-Granite										
102	Ap	0-10	14	28	58	SL	6.74	2.1	0.105	12.40
103	A2	10-30	20	34	46	L	6.11	0.6	0.049	11.70
104	Bw1	30-70	24	34	42	L	6.18	0.31	0.035	10.50
105	Bw2	70-89	24	40	36	L	5.73	0.38	0.014	9.80
106	BC	89-125	34	24	42	CL	5.33	0.84	0.042	14.40
Profile No.24 Middle Footslope Biotite-Granite										
107	Ap	0-15	10	10	80	LS	5.00	0.67	0.035	6.70
108	A2	15-27	14	12	74	SL	4.90	0.45	0.035	8.10
109	Bw1	27-61	18	16	66	SL	5.63	0.81	0.028	9.60
110	Bw2	61-90	24	14	62	SCL	5.70	0.71	0.007	8.40
111	Bw3	90+	16	18	66	SL	6.10	0.10	0.007	9.80
Profile 25:Depression Biotite-granite(Mangu Halle)										
112	Ap	0-17	14	14	72	S L	5.50	2.11	0.140	4.40
113	A2	17-33	16	28	56	S L	5.60	1.60	0.130	4.20
114	B1	33-61	20	30	50	L	5.50	1.50	0.140	5.30
115	B2	61-84	25	22	53	SCL	5.80	0.87	0.110	5.40
116	C	84+	16	18	66	S L	6.10	0.37	0.105	5.60
Profile No. 26 Gangare with application of urban waste										
117	Ap1	0-25	16	22	62	SL	5.80	4.82	0.15	28.61
118	A2	25-40	30	38	32	CL	6.60	2.48	0.12	10.82
119	Bg1	40-56	28	40	32	CL	6.10	0.33	0.04	9.30

120	B2	56+	16	18	66	SL	6.40	0.24	0.25	7.37
Profile No. 27 Gangare without application of urban waste										
121	A1	0-20	28	16	56	SCL	5.00	1.82	0.09	8.37
122	A2	20-50	26	18	56	SCL	4.60	1.39	0.05	8.72
123	Bw1	50-75	32	24	44	SCL	4.80	0.91	0.07	9.21
124	BC	75-100	30	24	46	SCL	5.00	1.05	0.07	11.52
125	C	100+	34	20	46	SCL	4.50	0.67	0.09	10.70

amount in the depression follows the same pattern with that of organic matter further stressing the importance of organic matter as a source of nitrogen in the soils. Indeed correlation analysis gave a strong and positive relationship of $r = 0.694$ between organic matter and nitrogen. This pattern of distribution with increase in content down slope was also reported by Weintraub et al (2015) who found that slope soils had lower total carbon and nitrogen stocks compared to relatively flat ridge soils. They attributed this to elevated N loss resulting from high rates of soil and particulate organic matter erosion. However, Raghubanshi (1992) has reported decrease in accumulation of organic carbon and nitrogen going down slope.

Profile characteristics show that soils in the depression and upper foot slope had appreciable amounts at the surface with values of 0.140 and 0.105% respectively. Nitrogen content was lowest at the middle foot slope as it was for virtually all the other soil properties. Profile distribution showed a general tendency for a decrease down the profile but the depression stands out because of the high content right down the profile. The nitrogen content of the soils can be regarded as low based on the standard given by Enwezor et al (1989) who have stated that soils with $<0.15\%$ are low. Even the soils in the depression that had the highest values were not up to this figure. The low nitrogen content of the soils can be attributed to a number of factors including the high preponderance of the sand fraction which affects both the water and nutrient holding capacities of soils, the faster rate of mineralization of organic matter in the tropical environment due to high temperatures and moisture as well as human factors including land use practices like bush burning and over grazing. The soil samples were collected on farmlands where the farmers were in the habit of annually tilling the soil as a means of weed control but this practice is known to increase the oxidation of organic matter and volatilization losses of nitrogen. Another important factor that could account for the low nitrogen content was the fact that the calculated C:N ratio for the soils

Table3. Results of t-test for soils with burnt urban waste

Soil variables	Soils with waste application		Soils without waste application		t-test
	Mean	Stdev	Mean	Stdev	
Clay(%)	13.67	1.51	20.67	3.01	0.001
pH (H ₂ O)	6.3	0.261	5.3	0.522	0.01
OM(%)	3.74	0.38	1.25	0.194	0.001
TN (%)	0.135	0.038	0.052	0.0098	0.001
CEC (cmol/kg)	22.14	2.7	9.03	1.09	0.001

were well below the 24:1 standard given by USDA/NRCS(2011) indicating that nitrogen is quickly mineralized in the soils.

The influence of management practices on nitrogen content was investigated by taking soil samples in an area where the farmers have been using burnt municipal wastes as fertilizer materials for a very long time. This was done at Gangare in Jos North LGA where dry season farmers have been using this method to fertilize their farms. A profile pit each was dug in an area with and without application of burnt municipal waste and the result showed that nitrogen content at the surface were 0.150 and 0.090% respectively (Table 2). Profile distribution showed a decrease down the profile for that without application while the cumulative effect of application had the highest content of 0.250% in the B2 horizon for the pit with application. Other soil properties also showed significant positive difference between the two treatments. T-test was conducted (Table 3) on the data generated and values obtained were 0.001 for nitrogen and between 0.01 and 0.001 for other soil properties indicating significant differences in the means of the two sets of data. This indicates that proper management can have positive effect on nitrogen content and soil fertility in general in the study area.

MANAGEMENT PRACTICES

Given the low levels of nitrogen in the soils studied, the need to increase the nitrogen stokes of the soils for sustainable crop production cannot be over emphasized. In view of the importance of organic matter as a source of nitrogen in the soils, any strategy to increase its content in the soil translates into higher nitrogen content. The farmers can use scientific methods of crop rotation by ensuring that leguminous crops are rotated with cereals and that in mixed cropping two cereals are not mixed on the same farm. This will allow an increase in the nitrogen content of soils over time.

Planting of cover crops has been recognized as a means for sustainable management of soil and water resources. They restore soil fertility, control weeds, avoid repeated seeding and cultivation traffic, conserve rain, reduce energy costs, improve soil physical properties and soil tilth and reduce soil erosion (Lal, 1995). It is suggested that farmers plant leguminous crops that add to the nitrogen content of the soil and may produce products that are useful to them. This can be achieved by planting any of the many varieties of local beans that are found in the different communities of the study area. Some species of forage grasses that could do well in the study area as suggested by Lal (1995) and Enwezor et al (1989) include *Andropogon gayanus* (Northern gamba), *Brachiaria decumbens* (Signal grass), *Cenchrus ciliaris* (Buffel grass), *Choris gayanus* (Rhodes grass), *Cynodon plectostachyus* (Giant star grass), *Digitaria smutsii* (Wolly finger grass), *Panicum maximum* (Guinea grass), *Pennisetum Purpureum* (Elephant grass), *Setaria anceps* (Setaria) and *Sorghum almum* (Columbus grass). Some of the suitable legumes include *Cajanus cajan* (Pigeon pea), *Centrosema pubescens* (Common centro), *Gliricidia sepium* (Almond blossom), *Leuceana leucocephala* (Leucaena), *Macrotyloma uniflorum* (Horsegram bean).

Mixed farming to take advantage of animal droppings as fertilizer material and crop residues as feed for the animals is another source of organic matter and nitrogen to the soil. Mohammed-Saleem (1995) has stated that integrating animal and crop production systems is based on the premise that by-products from the two systems are used on the same farm. He further opined that the benefits of mixed farming included draught power, closed nutrient cycling, improved environmental quality, and that the use of roughages and low quality feeds contribute to overall higher output per animal per hectare. In addition, the volume of organic components that circulate through the soil and plants and animal manures will improve soil fertility and ensure long lasting carry over effects.

CONCLUSION

The nitrogen content of soils formed on biotite-granite parent materials on the Jos Plateau are low and this is capable of negatively affecting sustainable crop production in the area. However, the use of appropriate management practices can help to tackle this problem as demonstrated by the use of burnt municipal waste by the farmers. The uses of more scientific methods of crop production such as mixed farming, crop rotation and cover crops have been suggested as possible means of overcoming this challenge.

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Mathematical Ideas in Cultural Artefacts: A Metaphor for Teaching of School Mathematics

Jaya Bishnu Pradhan

Department of Mathematics Education
Mahendra Ratna Campus
Tahachal, Kathmandu, Nepal
Email: jebipradhan@gmail.com

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Abstract- *Mathematics is taken as one of the difficult subject in school education. One of the reasons for taking mathematics as a difficult subjects is due to its abstract nature. The metaphor is a mapping of two conceptual domains: sources and target. The source domain helps student to translate their everyday experiences into an abstract and unfamiliar mathematical content knowledge known as target domain. The main objective of this paper is to explore the mathematical ideas embedded in cultural artefacts and its possibilities in the process of teaching mathematical content. The ethnography methodology was adopted and the procedures included in-depth interviews and observations were made. The mathematical knowledge hidden in their construction of Rangauli mandala and cultural meaning for community members have been analyzed with the written documents, photographs, video graphs produced. The mathematical ideas embedded in the cultural artefacts, arts and pattern design mediated to teaching of mathematical knowledge.*

Index Terms- Cultural Artefacts, Ethnography, Ethnomathematics, Metaphor, School Mathematics.

I INTRODUCTION

Metaphor is a mapping between two conceptual domains which provides a powerful tool to understand one domain of knowledge in terms of another. The conceptual metaphors help to deal with relatively unfamiliar and more abstract domains of experience in a familiar and tangible way. Metaphor simply means the representation of abstract entities through very simple, familiar and meaningful objects. It can be taken as a mapping that the abstract ideas map into concrete, strong and meaningful images that are developed in different social and cultural context for a different purpose. Thus, metaphors help to understand abstract ideas by mapping them into strong, meaningful images that are originally developed in a different context. English (1997) sees metaphors as tools for creating formal concepts out of image schemas, and of restructuring these concepts in complex ways. Lakoff and Nunez (2000) also argue that the conceptual metaphor's "primary function is to allow us to reason about relatively abstract domains using the inferential structure of relatively concrete domains," (p. 42) with structures of image schemas preserved by this mapping. Thus, metaphor can be considered as a mechanism for connecting two types of knowledge of which the new knowledge is comprehended through already existed familiar concepts.

Fyhn (2007) viewed that patterns in snow are examples of metaphors. Fyhn further maintained that "Some Sami mittens have the pattern grouse footprints on their edges. These repeating patterns show a connection between embodied experiences and ornamentation. Ski trails as well as animal footprints perform patterns in the snow, patterns with different symmetry properties" (p. 246). Further, Barton (2005, p. 100) points out that "Rather than thinking of the mathematics which is known world over through formal education, we need to expand our vision to include any form of quantitative, relational or spatial systems". Barton (2005) uses boats as a metaphor for mathematics. He claims that different boats can be used for different purposes, the fishing

boat can go to rocky places where the ferry cannot navigate and the ferry can travel under conditions too hard for the fishing boat. “It is the same world, but it is a different understanding. Neither is the truth” (p. 100).

Lakoff and Nunez (2000) discussed another type of metaphor called extraneous metaphors. According to them “...extraneous metaphor or metaphors that have nothing whatever to do with either the grounding of mathematics or the structure of mathematics itself. Unfortunately, the term metaphor when applied to mathematics has mostly referred to such extraneous metaphors” (p. 53). The staircase is an example of extraneous metaphor of the “step function” because when graphed the step function can look similar to a staircase. The image of staircase has nothing whatever to do with either the inherent content of the grounding of the mathematics, although the visual is a helpful reminder of how this function would look when graphed (Lakoff & Nunez, 2000, Bearden, 2012). Likewise, “Function is a machine” is a metaphor. The source domain of this metaphor is “machine” and the target domain is the mathematical concept of “functions”. Extraneous metaphors can be eliminated without any substantive change in the conceptual structure of mathematics, whereas eliminating grounding or linking metaphors would make much of the conceptual content of mathematics disappear.

Cultural artefacts is anything created by the culture of particular group of people which provides information about the culture of its creator and users. Gueudet and Trouche (2009) extend the definition of artefact by introducing the term resources to encompass any artefact with the potential to promote the process of learning. In this vein, Bonotto (2007) viewed that the extensive use of cultural artefacts makes school mathematics more meaningful. There are different types of cultural artefacts which reflects the cultural identity of different groups of peoples. Some of them are dress, houses, stuffs, paintings, design, and patterns and so on. For him, the cultural artefacts, introduced into mathematics classroom are concrete materials, which children typically meet in real life situations. Those concrete materials can be the suitable tools to transfer from one domain to another domain of knowledge. In this paper, I explored mathematical ideas embedded in cultural artefacts of *Rangoli* mandala and its use as an instructional materials that mediated the teaching and learning of school mathematics.

II RESEARCH QUESTIONS

This study was intended to explore the cultural artefacts and its pedagogical implications to assist students in enhancing their understanding of mathematical concepts at basic level of education. Considering these, the following research questions were formulated:

1. What are the ethnomathematics embedded in *Rangoli* design?
2. What mathematical concepts does teacher teach from cultural artefacts in mathematics classroom?

III METHODS AND PROCEDURES

The main objectives of my study were to explore mathematical ideas embedded in the cultural artifacts of *Rangoli* mandala and to analyze its possibilities in the process of teaching school mathematics. To do this, I have chosen to use qualitative research method, as I wanted to make sense of the complex world of the mathematical ideas and knowledge embedded in the out-of-school context of the students. Qualitative research relies primarily on the collection of qualitative data. It is a field of inquiry that crosscuts disciplines and subject matters (Denzin & Lincoln, 2005). In my study, I chose qualitative research design as I want to make sense of the complex world of the cultural artefacts, mathematical knowledge embedded in the *Rangoli* mandala and its implications in teaching of school mathematics. It would not be possible for me to quantify such ideas, perceptions and knowledge in figures and numbers. The mathematical ideas embedded in cultural artefacts and people’s feeling, beliefs, perception, attitudes understanding etc. regarding their activities cannot be captured and converted quantitatively.

Ethnography is a qualitative research methodology that seeks to understand human behavior within its own social setting. It is a process which combines the knowledge of participants who belong to certain cultures and the skills of the researcher or the ethnographer (D’Andrade, 1981). Thus the ethnographic research is an amalgam of participant observation and many of the characteristics of nonparticipant observation studies as well in an attempt to acquire as holistic picture as possible of

a particular society, group, institution, setting or situation. To carry out my research objectives, I used in-depth interviews and non-participant observation. I prepared an interview guideline and observation protocol for parents and teachers so that it would be easier for me to generate the data in the fields (Creswell, 2009).

Interviewees were asked some questions and based on their responses another question was asked to get information for the study. Interviewees were allowed to speak freely about their feelings. Because taking notes can interfere with the flow of conversation, a voice recorder was used by the researcher to record all the responses from participants of interview. I carefully recorded all the possible conversations with the help of the video camera and take field notes as much as I could. My data generated from the out-of-school culture reflect how much they are rich in terms of ethnomathematical ideas and knowledge. I collected the data from the multiple sources during the course of my study. I reviewed all of the data gathered from the multiple sources of data (Creswell, 2009) and then organize it into categories or themes that cut across all of the data sources. And then, I converted the conversations and interviews into manuscripts so that I could easily analyze and interpret them.

The main task in the research is to analyze and interpret the data that I collected from the field. After observing the data, I linked with many possible theories to interpret them. I triangulated the data, triangulated the theoretical closures and gave meaning to my findings. In this process, I tried to produce the accurate descriptions of the contents. Interpretation involved attaching meaning and significance to the analysis, explaining descriptive patterns, and looking for relationships and linkages among descriptive dimensions. In my study, the cultural artefacts in the students' community and their ways of understanding the natural phenomena, and their ethnomathematical knowledge were analyzed with the notions of pluralism. In this study the analysis of the research was validated and make more reliable by triangulating the statements among the research participants, their ways of presenting the text in the several times of data collection periods.

IV MATHEMATICAL IDEAS EMBEDDED IN CULTURAL ARTEFACTS

Nepal has rich cultural traditions and peculiar rituals. *Rangauli* is a symbol of good fortune. Rice powder used for *Rangauli* drawings provides nourishments for smaller animals, such as birds and ants. This is a symbolic act of showing the necessity of sharing and maintaining proper relationships with others. It also reinforces the respect for nature and relationship with other human beings and animals. This art form is almost exclusively practice by Hindu women. *Rangauli* has been constructing as cultural product from generation to generation in a process of craft model approach.

The *Rangauli* mandala is constructed in the occasion of *Dipawali*. The *Rangauli* is drawn by the rice flower including seven different colors and seen on the floors of buildings and in front of worship room (*Puja Kotha*). This drawing requires different geometrical patterns and spatial reasoning. The number of concentric circles, symmetries, vertical and horizontal reflections and rotations etc are found in the *Rangauli* mandala. The different colorings are also associated with this drawing. Regarding the construction of *Rangauli* mandala, I asked to one of my research participant P_1 , how to draw a mandala pattern. She replies:

The mental images of the pattern motive to draw a Rangauli mandala. The cognitive map of the mandala is important things for that. We start from a point and draw some concentric circles. Anyone can draw different shapes inside the regions in concentric circles. Some may draw an eight-pointed star or eight petals of a lotus as per their choices.



Figure 1. Rangauli Mandala

From the interview with P_1 , I have come to know that the construction of mandala is a mental construction. Embodied cognition of the creator of the mandala help to perform their task. They have already shaped the image of the mandala in their mind. However, the different geometrical pattern found in their construction is largely hidden from the participants. And the ways

of drawing of such cultural arts and artefacts is craft model approach. The figure 1 was the mandala constructed by P_1 herself in front of main doorways of house. I also asked her that how to draw the eight-pointed star. She had already done this before I meet to her but said that she would work it out. She started with a rough diagram. The process of her drawing was that first, she draw a circle, and then she first divide the circle in four equal parts by drawing two mutually intersecting lines. Further the four parts be divided in to another halves by bisecting the quadrants. She draw a concentric circles with larger radii than previous one. She made isosceles triangle whose vertex at the circumference of the outer circles and the base at the inner circles.

From the observation of rough sketch of the ways to drawing an eight-pointed star, I have come to know that they are practising sophisticated mathematical ideas in the process of constructing mandala. I asked another research participants P_2 about the knowledge they learnt to construct such beautiful artefacts and her mathematical ideas associated with it. She replies:

I learnt to make this artefact by observing the ways of drawings of my mother as in the same of how these children observing patiently to my activities here. First I draw a sitting place for goddess Laxmi at the centre as we are going to worship the goddess. Then I drew some larger circle and eight petals of lotus as we believe that she likes to lye over the lotus flower.

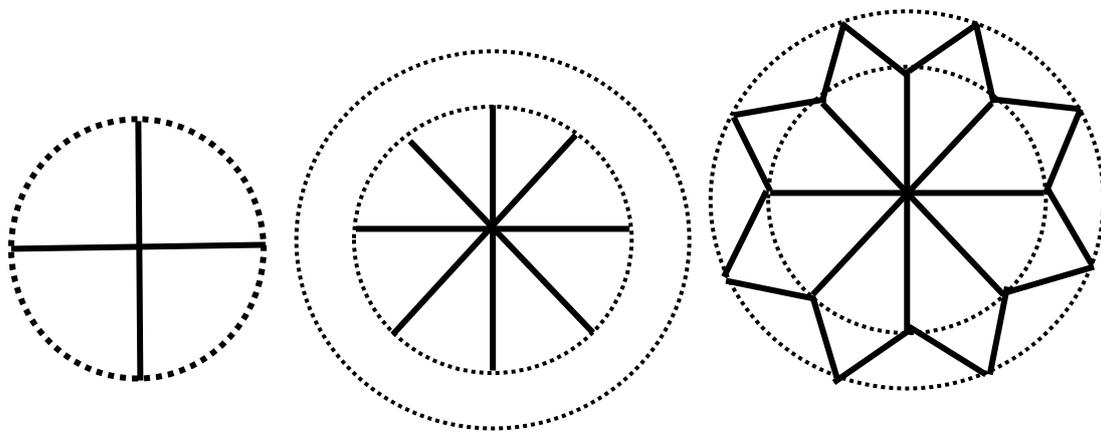


Figure 2. Process of Construction of Mandala

The *astamatrika* or eight-pointed star has great significance and has religious meaning in Hindu culture. The *Rangauli* drawing involves complex mathematical activity and strategic understanding of spatial reasoning. It is important to explore the hidden mathematical ideas in the process of constructing such cultural artefacts. For that, I have conducted interviews with some people who are constructing such artefacts as their cultural tradition. On the basis of an interview with some people and observations of ways to construct as their cultural tradition, I have come to know that they possess sophisticated mathematical ideas of concentric circles, coordinate axes, and symmetry in the process of construction of the mandala. The common practice of creating mandala is based on the concept of both bilateral and rotational symmetry. The different colorings are also associated with drawing. The *astamatrika* or eight-pointed star has great significance and has religious meaning in Hindu culture. The creation and perception of the pattern have a logical as well as aesthetic component (Ascher, 1991). The use of mathematics in the arts and design makes the things pretty and aesthetic (Hardy, 1978). Every beautiful thing in the world possesses the mathematical properties, and the images possess the golden ratio. If we observed patiently the objects, many mathematical ideas of ratio and proportion, symmetry, tessellations, reflection are found. However, the designers and workers might not have formal mathematical knowledge.

V POSSIBILITIES OF INCORPORATION IN MATHEMATICS TEACHING

Teaching mathematics becomes more interesting if the contents are related to the students' familiar environments. Students' everyday interaction with the cultural environment provides more opportunities to interact and conceptualise mathematical ideas. The cultural environment activities and artefacts of the students involve a lot of mathematical knowledge and

ideas. The mathematical ideas embedded in the students' cultural environment which is familiar to the students provide a good environment to learn. This environment plays important tool to communicate mathematical ideas.

Mathematical ideas and thinking are embedded in every environmental activity of a group of people. However, the mathematical ideas they possess in order to perform their everyday job remains largely hidden. Mathematical anthropology uses mathematical modeling in historic, ethnographic, and material culture studies to describe material and cognitive patterns of certain group of people (Eglash, 2001). In this vein, Rosa and Orey (2010) viewed that mathematical modeling is a methodological tool that may be used in the ethnomathematical program. Ethnomathematics can reshape our greater cultural identity in a positive way by requiring the inclusion of a greater representation of the true mathematical practices and problems for a students' own community (D' Ambrosio, 1998; Zaslavsky, 1996). The people of the different culture around the world prevalence of symmetry in designing textiles, sand painting, wall painting, pottery, arts, and artefacts.

The mathematical ideas practiced in students' environmental context may be used as a cultural metaphor for the teaching and learning of school mathematics. The informal mathematical ideas and knowledge that practices and uses in the everyday activities are the sources domain for the understanding of abstract mathematical ideas. Thus, the ethnomathematical system of the cultural group can enable a better understanding of school mathematics. Regarding the possibilities of incorporation of cultural artefacts for teaching of school mathematics, one of my research participants T_1 says:

I believe that mathematics is evolve from the culture. The different group of people are using mathematical ideas implicitly in their profession. Their children are also doing same work what their parents do. Children are also using same kind of mathematics. But the real problem is to connect their mathematics to school mathematics.

Most of the research participants reported that mathematics originated from the cultural activities of different society, from different racial groups around the world. Different professional group of people are using mathematical concepts and ideas without knowing the meaning of mathematics. My data in the construction of the *Rangauli* mandala claims the embeddedness of hidden mathematical ideas on it. Their implicit mathematics knowledge of the group of people provide an opportunity to their children to learn mathematics in the classroom. Our school pedagogy has given much importance to rote learning and it is not converged with the ways of knowledge generation and distribution of the local people (Pradhan, 2017). Thus, I observed that the pedagogy we adopt in school does not acknowledge out-of-school knowledge of the students. However, the pedagogy used in out-of-school context was the craft model approach, which is common to the knowledge generation and distribution. This involves participatory and cooperative approaches in which they learn with the help of their parents as Vygotsky sees learning as an activity in which shared mathematical meanings are constructed socially. Thus, the mathematical ideas embedded in out-of-school context and the pedagogy they use could be the powerful metaphors for the teaching and learning of school mathematics. Teachers who have children cultural background and funds of knowledge can link in the classroom. In same vein, another research participant T_2 viewed that

I never felt that mathematical ideas can be found in the out of school culture. However, mathematics is the cultural product. How can school mathematics be taught to the students' taking help of their home cultural activities becomes problematic task.

Other research participant T_3 opined that:

We teachers do not have time to think about to make mathematics teaching more culture friendly because of the overloaded curricula and over duties in classroom teaching.

Connecting with same question, other research participants questioned that how teacher can think his lesson more culture friendly if they do not have sufficient time to manage. But, other teacher gives serious limitations of the teachers to make their class more culture friendly. Time is not the problem at all to use cultural metaphors in the teaching and learning of school mathematics. Attitude and knowledge of the teachers about the cultural metaphors for teaching school mathematics is more problematic. But the problem is that the lake of ideas on the selection of cultural metaphors for the teaching of particular content

of school mathematics. The teacher of mathematics need not to think about the cultural metaphors for teaching and learning. They believe that incorporation of culture friendly pedagogy need more time and extra effort to classroom teaching. With regarding to the use of cultural metaphors for the teaching of school mathematics, my research participant T₁ opined that:

The use of cultural metaphor in the mathematics teaching is evident. But we are unable to use it in our classroom teaching. How can a teacher who have responsibility of taking five to six periods in a day can manage their own class from culture friendly pedagogy? How to prepare class with the view of cultural metaphor for certain mathematical content? If a teacher has one or two periods of responsibility, then s/he can think about which cultural metaphor fitted most appropriately.

Most of my research participants agreed with the view of T₁ They all accept the importance of cultural metaphors for the conceptual understanding of the mathematical concepts. The incorporation of cultural metaphors in the process of teaching and learning of mathematics enhances mathematical understanding to the students. From the interaction of my research participants, it was found that there are a lot of informal mathematical ideas present in the construction of *Rangauli* patterns. Those mathematical ideas are the effective metaphors to develop spatial reasoning and communicate the abstract mathematical ideas. I found that the teachers were using ethnomathematical ideas of a different group of people as a metaphor in the process of teaching and learning of classroom teaching.

VI CONCLUDING REMARKS

There are different cultures and traditions in every society. The significance and rationale behind the cultural arts and artefacts are almost unknown in reference to the mathematical concepts, ideas and knowledge; though the different group of people have been engaged for a long time. The people has implicit mathematical knowledge while performing their everyday job. The way that they construct is usual activities but possesses high mathematical concepts from the eyes of ethnomathematics. Using ethnomathematics as the pedagogical tools in the mathematics classroom help students learn not only mathematical concepts but also cultural elements.

The cultural artefacts regarding mathematical ideas are considered as the cultural metaphors for the teaching and learning abstract concepts of mathematics at the basic level of education. The mathematical ideas practising in students' environmental context may be used as cultural vehicles for the teaching and learning of school mathematics. The informal mathematical ideas and knowledge that practices and uses in the everyday activities are the source domain for the understanding of abstract mathematical ideas. Thus, the ethnomathematical system of the cultural group can enable a better understanding of school mathematics.

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THE CONCEPTS OF *SHAFĀ'AH* AND *ISTIGHĀTHAH* (INTERCESSION AND SUCCOUR) IN THE SOKOTO CALIPHATE

Prof. Ja'far Makau Kaura
Department of Islamic Studies
Usmanu Danfodiyo University, Sokoto
jmkaura855@gmail.com
08067050641

Shehu Abdur-Rahman Aboki, Ph.D
Department of Islamic Studies
Usmanu Danfodiyo University, Sokoto
abokishehu67@gmail.com
08032318313

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Abstract

Shafā'ah and *Istighāthah* are both Sufi terminologies that have become controversial areas of discourse. While *Shafā'ah* is intercession and pleading on behalf of someone with Allah on the Day of Judgement *Istighāthah* is the saving power of *Awliyā'* Allah and seeking help from them dead or alive. These have also attracted serious debate between the Sufi followers and the non-Sufis especially the *Izalah* group and in most cases condemnation from the non-Sufi groups. References are often made to both the Glorious *Qur'an* and *Hadīth* literature to justify the correctness or otherwise of the application of the two concepts in daily life. This paper looked at the perspective of the Sokoto Jihad leaders in application of *Shafā'ah* and *Istighāthah* as they understood and believed in them. The literary contributions of the Jihad leaders in this subject-matter have been studied to justify their belief and practice of intercession and saving power of some individuals, *al-Qur'an*, the Prophet Muhammad (S.A.W), his *Sahābah* and other righteous servants of Allah. However, the paper contends that the commitment and approach of the Jihad leaders to these Sufi terms were done without any ulterior motive but which unfortunately led to veneration of tombs of *Awliyā'* and other servants of Allah (S.W.T). Some practices among some contemporary Sufi followers require critical examination especially that some non-Sufis likened them to polytheism. The paper recommends that the pristine moderate approach to spiritual and ethical training established by the Jihad leaders should be adhered to for an acceptable *Shafā'ah* and *Istighāthah*.

Key Words: *Shafā'ah*, *Istighāthah*, intercession, succor, Sokoto Caliphate

1. Introduction

The two concepts, *Shafā'ah* and *Istighāthah* are part of the controversial aspects of *Tasawwuf*. Even though the Sufis believe that the concepts have a root in the Glorious *Qur'an* and *Hadīth*, some scholars strongly reject the way the concepts are being interpreted by the Sufis which gives room for *Awliyā'* to claim saving powers in both this world and the Day of Judgment. These concepts are part of Sufi legacies bequeathed by the Sokoto Jihad leaders. They examined the concepts in the light of the *Sharī'ah* and indicated when and where they are allowed and when and where they are not allowed, buttressing their contentions with examples from the past *Awliyā'*.

When one examines the verses of the Glorious *Qur'an*, one finds references to the concept of *Shafā'ah*. However, the understanding of the concept depends largely in the context in which it has been used. The exclusive power to grant permission for intercession rests with Allah. No one, not even a Prophet can intercede without the permission of Allah. That is why *al-Qur'an* describes as futile the efforts of those who sought for intercession, with Allah, from either animates or inanimate.¹ Therefore, for one to merit being

¹ *Qur'an* 2 verse 44, 21 verse 28, 19 verse 87.

interceded for with Allah, one has to be a good Muslim and should have sent forth good deeds upon which the person granted the power of intercession can intercede with Allah on his behalf. This means that belonging to a brotherhood or attaching oneself to a *Walī* does not help one if one is not a believer and practicing Muslim. There are many verses related to this contention. In the Qur'an For example, Allah says:

None shall have the power of intercession, but such a one as has received permission (or promise) from (God) Most Gracious²

Another verse says:

And those whom they invoke instead of Him have no power of intercession - except for those who bear witness to the truth knowingly and they know³

In another verse, the types of persons to be saved have been made clear. They are the people who have faith in Allah, follow the commands of Allah, keep away from prohibitions and repent at any time. These are the people on whose behalf the Angels will intercede with Allah. Similarly, there are some conditions to be fulfilled by those who could claim saving powers. One of such conditions is the permission from Allah.

Any claimant to such power, without an assurance from Allah is an impostor. The second condition is that the saving person must have been a believer to the truth⁴. In other words, he must be a good believer whose belief is unadulterated.

The inference from the above discussion is that power of intercession is not a gift to all and sundry, but it has been reserved for some people. This, therefore, brings to light the criticism of those who are very critical about the concept of *Shafā'ah* as interpreted by *Sufi* Shaykhs⁵ whose doctrines bestowed upon *Awliyā'* the power to intercede with Allah (SWT) on behalf of their followers without any discrimination⁶.

The conditions laid down in the verses of the Qur'an for both saving persons and the people who merit to be saved indicate that the generality of believers have shares in both the saying powers and the privilege to be saved. Such should not be limited to Sufis and *Sufi* Orders only.

Hadīth literature had also asserted the saving powers of some individuals. For example the *Shafā'ah* of Prophet Muhammad (S.A.W.) on some groups of Muslims is found in *Hadīth* literature. In one of such *AHādīth*, it is related that on the Day of Judgment people would go to Adam, requesting him to intercede with Allah on their behalf. He would direct them to Prophet Nuh (A.S.) who would also refer them to Prophet Ibrahim (A.S.), and Prophet Ibrahim to Prophet Musa (A.S.) and Musa to Prophet Isa (A.S.) who would ask them to approach Prophet Muhammad (S.A.W.). Prophet Muhammad (S.A.W.) would humbly proceed to the presence of Allah for the intercession; and Allah would grant him the power to intercede.⁷ In another *Hadīth* it was reported that the Prophet (S.A.W.) used to slip out of bed in the night to go to the grave yard of *Baqi'ah* and pray for the dead.⁸

² Q19: 67

³ Q43:86

⁴ Q43:86

⁵ *Izalatul Bid'ah wa iqamatis Sunnah* is among them.

⁶ Ahmad al-Tijani promised his *Shafā'ah* to all his followers even if a follower commits a sin equivalent to murder of 70 people. This is only demonstrating his saving power but not a license for a follower to engage in unwholesome behavior.

⁷ Imam Bukhari, *Sahih al-Bukhari, Kitab al-Tawhid*, section 19

⁸ Imam Muslim, *Sahih al-Muslim, kitab al-Janazah*, section 59

During the early period of the development of *Tasawwuf*, *Shafā'ah* was used as the quality for identifying people of Allah. Such people are reported to possess the power to intercede with Allah on behalf of others on the Day of Judgment. In such *Sufi* literature, Uways al-Qarani occupies an important position. His coming was said to have been foretold by the Prophet (S.A.W). The Prophet (S.A.W) was also reported to have attributed saving powers to Uways. He will, in the Hereafter, intercede with Allah on behalf of people whose number is estimated to reach the population of Rabi'atu and Mudar tribes.⁹

Rabi'ah al-Adawiyyah, another early woman saint was also described by the Prophet (S.A.W) as a *Walī yah* who would intercede with Allah for seventy thousand people from the *Ummah* (community) of the Prophet (S.A.W).¹⁰ Even though it is possible that the two *AHādith* relating to the two saints could be fabrication, it is noteworthy that the concept was known in the early period of *Tasawwuf*. Later, after the foundation of *Sufi* Orders, the power of intercession became synonymous with leadership in *Sufi* Orders. Other *Awliyā'* within the *Sufi* Orders were also given the same recognition.

The founder and leader of Qadiriyyah Order, *Shaykh* AbdulQadir al-Jaylani is, as far as Qadiris are concerned, the leader of saving *Awliyā'* in the Order. It is believed by the Qadiriyyah followers that *Shaykh* AbdulQadir would intercede with Allah for them on the Day of Judgment. The magnanimity is also extended to those who might have heard of him provided that they do not speak evil of him.¹¹ His saving powers have been extensively discussed by the *Jihad* leaders. The founder of Tijaniyyah, *Shaykh* Ahmad al-Tijani is also regarded by his followers as their saving *Walī*.¹²

2. The concept of *Shafā'ah* in the Caliphate

In the Sokoto Caliphate, the belief in the saving power of *Awliyā'* had received favorable treatment. Majority of the people who had the belief were Qadiriyyah followers. From all indications the belief in *Shafā'ah* cut across *Sufi* Orders. It is also apparent from their writings that Invocation for *Shafā'ah* was not limited to the *Awliyā'* but rather extended to any creature considered Holy, hence, the search for *Shafā'ah* through the 'Qur'anic verses, Prophets of Allah, the Angels and the righteous people of Allah. Their discussions on variety of saving powers possessed by different *Awliyā'* are informative on this doctrine. The doctrine stresses the extent of the power of *Shafā'ah*.¹³

It is believed that it is not only the invocation of a *Walī's* powers of *Shafā'ah* according to the doctrine that guarantees the possibility of salvation, but also one's burial near the grave of a *Walī* may facilitate such a salvation.¹⁴

According to the *Jihad* leaders, the power of intercession of a *Walī* depends upon his relationship with Allah. Whereas a *Walī* will be granted the power to save uncountable number of people, like Uways al-Qarani, the power of others is limited to their own period,¹⁵ as against one whose power extends from his time to the end of the world like AbdulQadir al-Jaylani and Ahmad al-tijani. The *Jihad* leaders were also optimistic that anyone who clings to a *Walī* merits that *Walī's* *Shafā'ah*.¹⁶ This is discerned in their writings in

⁹ M. Bello, *Raf al-Ishtibah fi al-Ta'alluq bi Allah wa bi ahl Allah*, "Ms", C.I.S., 2/4/698.

¹⁰ A. J. Arberry, (trns), *Muslim Saints and Mystics*, *Op Cit.*, p.41.

¹¹ M. Bello, *al-Budur al-zahiriyyah fi Salasil al-Qadiriyyah*, "Ms" f. 36, 3/1/11

¹² M. Bello, *Raf al-Ishtibah fi al-Ta'alluq bi Allah wa bi ahl Allah*, "Ms", C.I.S., 2/4/698 f. 12b.

¹³ J. M. Kaura, "The *Sufi* Dimension in the Sokoto Caliphate", Ph.D Thesis, Department of Islamic Studies, Usmanu Danfodiyo University, Sokoto, 1991, p. 330.

¹⁴ *Ibid*, p. 330

¹⁵ M. Bello, *Raf al-Ishtibah fi al-Ta'alluq bi Allah wa bi ahl Allah Op Cit.* p.4b

¹⁶ *Ibid*. p.4b

which they sought the *Shafā'ah* of *Awliyā'* such as 'AbdulQadir al-Jaylanl and Ahmad al-Rifa'i. A good example of this is reflected in the composition of Isa bn *Shaykh 'Uthmān* in which he invoked the *Shafā'ah* of his father.¹⁷

Muhammad Bello had extensively dealt with the issue of intercession concentrating significantly on the ability of saving *Walī* to intercede with Allah on behalf of others. According to him it is not all the people that could benefit from the *Shafā'ah* of a *Walī* that appears thereof. A good number of people may benefit from the *Shafā'ah* of a *Walī* and sometimes the benefit may go to only one person or even to none.¹⁸

Similarly, there could appear a *Walī* who intercedes on behalf of people without any condition. In other words, his saving power does not require allegiance to him or require any spiritual relationship between him and the person to be saved. Bello quoted Abu Yazid al-Bistami to justify the possibility of its occurrence. Al-Bistami was once asked by someone who requested him to guide him to 3 deeds that could draw him very close to Allah. His reply was:

Love the *Awliyā'* of Allah and they will love you. Surely Allah looks into their hearts; and He may see your name in the heart of His *Walī* and forgive you.¹⁹

It is also found among the *Awliyā'* a *Walī* on whose account Allah (SWT) forgives thousands of His servants.²⁰ Such servants include both the Sufis and non-Sufis. However, some *Awliyā'* such as al-Shadhili, restricted their saving powers to only those who received and practiced their *Wird*.²¹ Al-Shadhili promised to intercede for anyone who recites *Hizb al-Kabir*. That person will be saved by Allah from the greater trepidation and will merit the *Shafā'ah* of Prophet Muhammad (S.A.W.), and will be raised among *Awliyā' ullah* in the paradise²². Similar promises were made by Ahmad al-Zarruq for those who observe his *Wazīfah*, the *Jumu'ah* prayers and fasting of Mondays and Thursdays. He promised them death within the precinct of Islam and salvation in the Day of Judgement and in this World protection from humiliation, and whenever they invoked his name for any help he will render it.²³

Seven people who had seen each other the first of whom had seen a particular *Walī* would all merit the intercession of that *Walī*. The only condition attached to it is that the seven people would in succession say that "I have seen you". If this condition is fulfilled, the seven people have been promised paradise by the great *Qutb* AbdurRahman al-Tha'alabi.²⁴ *Shaykh 'Uthmān* observed that such a promise by the pious people is allowed under the *Sharī'ah*. He said:

It cannot be disputed by either reason or *Sharī'ah*. This is because the bounty of Allah is so great that it cannot be quantified. The *Awliyā'* of Allah are gate-ways through whom He manifests His bounty. They have a sublime position with their Lord the magnanimous, the bounty giver.²⁵

There are also *Awliyā'* whose *Shafā'ah* is limited to people upon whom they set their eyes. Ibn al-Arabī, according to Bello was among such *Awliyā'*. The premises upon which this belief is based is that the saving *Walī* does not forget anyone he sees and would, therefore, intercede for him on the Day of Judgement.²⁶ Praying behind a saving *Walī* and reading his book

¹⁷ M. Hiskett, *the Development of Islam in west Africa*, Longman, London, 1984, p.248

¹⁸ M. Bello, *Raf'ul Ishtibah*, *op.cit.*, pp. 13a and b

¹⁹ *Ibid*, p.p 6b – 7a

²⁰ *Ibid*, p.5b

²¹ The same claim was attributed to Al-Bakri who said that whoever recited Salat al-Fatih and does not enter paradise should hold him in front of Allah.

²² M. Bello, *Raf'ul Ishtibah*, *op.cit.*, p.5b

²³ *Ibid*, p.6a

²⁴ *Ibid*, p.5b

²⁵ U. B. Foduye, *Ajwabah al-Muharrarah*, pp. 30-31

²⁶ M. Bello, *Raf'ul Ishtibah*, *op.cit.* f. 5a

guarantees the intercession of the person who prayed behind him or read his book²⁷. Similarly love of a saving *Walī* or being buried by his side would qualify the lover or dead to benefit from the saving powers of the *Walī*.²⁸

From the above discussions on intercession, it appears that the *Jihad* leaders had seen nothing wrong in the concept of intercession. In fact, *Shaykh* 'Uthmān had thoroughly discussed the concept and concluded that phrases such as "*Midun Kalfani*"²⁹ and "*Kuna Tawlefi*"³⁰ all denoting "we seek for your help" are allowed. He had approved the use of such phrases on the ground that they are based "upon good opinion" of the *Walī* and the hope of the person beseeching for the intercession. Therefore, if such a person would attain the position of saving, he would be asked to save.³¹

The *Shaykh's* approval of this is also based on his understanding of the interpretation provided by Jalal al-Din al-Mahalli on the following verse:

The Day when no protector can avail his client in aught, and no help can they receive³²

According to Mahalli as quoted by *Shaykh* 'Uthmān:

They are believers and some of them would intercede on behalf of others with the permission of Allah.³³

His conclusion is therefore that *Sharī'ah* allows one to hope for what is expected to happen as against what would not occur. *Shaykh* 'Uthmān, Justifying his argument on the concept of *Shafā'ah* quoted the following *Hadīth*:

The *Awliyā'*, '*Ulamā'* and all good people are among those who would intercede on behalf of mankind on the Day of Judgment.³⁴

This was assumed by the *Shaykh* to Justify intercession on the Day of Judgment. Therefore since *Hadīth* has established it, there should not be any obstacle for laymen to invoke the names of *Awliyā'* for intercession on that Day.

3. *Al-Istighāthah* in the Caliphate

Al-Istighāthah is to plead with someone for the fulfillment of pressing needs in this world. This is done through different ways. In the Sokoto Caliphate, it is done not only through *Awliyā'* dead and living, but also through either godly people and verses of the Glorious Qur'an. AbdulQadir b. Gidado had extensively examined the issue in his book *Al-Iktifa' li ahl al-Ta'assi wa al-Iqtida'*. He argued that it is possible and allowed to use the agency of the contemporary *Awliyā'* to plead with them for the fulfillment of desires. He has justified this claim on the understanding that *Awliyā'* are intermediaries between mankind and Prophet Muhammad (S.A.W.) who is the gate-way of servants to Allah. 'AbdulQadir cited the examples of *Shaykh* 'AbdulQadir al-Jaylani who he considered as not only the gate-way to the Prophet (S.A.W.) but also to Allah (S.W.T).³⁵ This observation is more elaborately discussed by Bello in his *Budūr al-Zāhiriyyah* in which he made the following remarks in respect of *Shaykh* 'AbdulQadir al-Jaylani:

Shaykh 'AbdulQadir used to say who-ever asked for my *Istighāthah* (succor) in a calamity, I will surely remove (the calamity off him); and whoever calls me by my name in a distress I will remove his sorrow from him. Whoever pleads with me to Allah... for a pressing need I will fulfill his request...³⁶

²⁷ *Ibid*, f. 5 and 6a and b

²⁸ *Ibid. op. cit.*, ff. 5-6.

²⁹ Fulfulde Language

³⁰ Hausa Language

³¹ U. B. Foduye, *Ajwabah al-Muharrarah op.cit.* p.27

³² Q 44:41.

³³ U. B. Foduye, *Ajwabah al-Muharraah, op.cit.* p.28.

³⁴ *Ibid*, pp. 27-28.

³⁵ A. B. Gidado, *Al-Ikhtifa' li ahl al-Ta'assi Wa al-Iqtida, op.cit.* ff. 29b and b.

³⁶ M. Bello, *Al-Budur al-Zahiriyyah, op.cit.* f. 38a.

Even though they were accomplished Sufis, the *Jihad* leaders did not limit their *Istighāthah* to *Awliyā'* alone but extended it to the founders of the four schools of law³⁷. According to ^oAbdulQadir b. Gidado, a seeker of favour from Allah could use the agency of the four Imams, the leaders of Shadhiliyyah *Sufi* Order, and the past and present *Awliyā'*³⁸. Similarly, the four accomplished *Awliyā'*, namely *Shaykh* 'AbdulQadir al-Jaylani, *Shaykh* Ahmad al-Rifa'i, *Shaykh* Ahmad al-Badawi and *Shaykh* Ibrahim al-Dasuki were identified as *Awliyā'* capable of extending the request of a seeker who employed their intermediary to the Prophet (S.A.W) and Allah, the most High. Their position of *Wilāyah* as the leaders of *Awliyā'* and mankind has afforded them the power to extend the request of the seeker to the Prophet (S.A.W) and Allah (S.W.T).³⁹

Shaykh 'Uthmān bn Foduye had also attained the position of mediation between the servants and the Prophet (S.A.W). ^oAbdulQadir b. Gidado, like AbdulQadir b. al-Mustafa, believed that *Shaykh* 'Uthmān had been gifted with the blessing.⁴⁰ It has therefore become a common occurrence to Jihadists to invoke the name of the *Shaykh* in times of need. This was a palpable phenomenon in the battle fields whereby Muhammad Bello was seen invoking the name of the *Shaykh*. Names of the *Sahābah* of the Prophet (S.A.W.) were also used as medium through which *Istighāthah* was sought. The *Sahābah* were considered as having power to mediate with Allah and extend the request of the seeker to the Prophet (S.A.W). Similarly, verses of the Qur'an were also used as medium of *Istighāthah*. Accordingly, *Fatihah al-Kitāb*⁴¹ was for example used by the Sokoto *Jihad* leaders to extend their requests to Allah.⁴² In one of his sayings, as reported by the *Jihad* leaders, *Shaykh* 'AbdulQadir was reported to have said that:

Whoever prays two *Raka'āt* reciting *Surah al-Ikhlās* eleven times after *Fatihah al-Kitāb* in each *Raka'ah*; and then recites *Salāt 'alan Nabiyy* and mention my name and his needs, surely it would be fulfilled by the Grace of Allah.⁴³

The *Istighāthah* of *Shaykh* 'Uthmān had benefitted individuals in a distant place when they sought his help. Instances of these involved a man and a woman who benefitted from the *Istighāthah*. A man called Abdullah from Kano, a brother of *Qādī* Datti had his arms and clothes looted by a group of enemy during a campaign. When the enemy decided to kill him, 'Abdullah invoked the name of the *Shaykh* to use his *Karāmah* and rescue him. Immediately he invoked the *Shaykh's* name, the enemy changed their earlier decision, released him and his looted property was returned to him.⁴⁴ It is also reported that a woman met armed robbers on her way. She promised to take to the *Shaykh* three thousand cowries if Allah would deliver her from evils of the robbers. When she came near them, the robbers asked her with whom was she travelling, she answered with her husband. When they looked beyond her, they saw a well armed *Majusi*, (magus). They therefore allowed her to pass.⁴⁵

The *Shaykh's* power of *Istighāthah* is an accepted phenomenon in the Caliphate. His name was invoked by the Jihadists and it proved helpful. An instance could be seen from the way AbdulQadir b. al-Mustafa sought and benefitted from the *Istighāthah* of the *Shaykh*. 'AbdulQadir mentioned that:

...it occurred to me many times that I coveted for my pressing needs to be fulfilled by Allah. I, one day, engrossed myself in prayer beseeching *Awliyā'* ... While I was in this state, an invisible caller told me to invoke the

³⁷ The founders of the four schools of law are Malik bn Anas, (709-795), Abu Hanifah (697-767), Al-Shafi' (766-820) and Ahmad bn Hanbal (775-855)

³⁸ A. B. Gidado, *Al-Iktifa' li ahl al-Ta'assi wa al-iqtida*, *op.cit*, f.30b

³⁹ *Ibid*, f. 30a

⁴⁰ *Ibid*, f. 28a

⁴¹ It is the first chapter of the Glorious Qur'an.

⁴² A. B. Gidado, *Al-Iktifa'*, *op.cit*, p 31a.

⁴³ M. Bello, *Al-Budarul Zahiriyah*, *op.cit*, p. 39a

⁴⁴ G. B. Lema, *Raudu'l Jinan*, Local Print.

⁴⁵ *Ibid*, pp, 6-7

name of *Shaykh 'Uthmān*. I obeyed and, beseeched for (Shaykh's) help, and, Allah granted my desire in the morning of that night...From that time, (whenever I have pressing needs), I beseech the name of *Shaykh 'Uthmān*.⁴⁶

The belief that *Awliyā'* in general and *Shaykh 'Uthmān* in particular have the power to render help in this world, is an accepted belief not only in the circle of the Sufis but also among the populace. Despite frantic efforts to eradicate the belief in power of intercession among the populace, people persistently invoke the name of *Shaykh 'Uthmān* on a slight occurrence. For example *Jama'atu Izalatil Bid'ah wa Iqamatis Sunnah* has continuously criticized this doctrine and likened it to polytheism. Their line of argument is that it is only Allah who can render such help and therefore resorting to *Awliyā'* means negating the power of Allah.⁴⁷

4. Conclusion

The *Jihad* leaders, judging from what has been discussed, were *Sufi* scholars who enriched the concepts of *Shafā'ah* and *Istighāthah* with their knowledge and wealth of experience. What seems to have helped the development witnessed in these concepts could be the non-partisan attitudes of the leaders whereby they learnt by studying and reading the works of even non-Qadiri *Awliyā'*. Very importantly, information about the phenomenon of both *Shafā'ah* and *Ighathah* during the *Jihad* and post *Jihad* periods had been properly documented by some of them especially Muhammad Bello. The moderate form of *Tasawwuf* professed by the *Jihad* leaders especially in commitment to *Shafā'ah* and *Istighāthah* is reflected in their genuine approach to spiritual and ethical teachings. This was done without any ulterior motive. What had become of commitment to these concepts after their demise in the *Sufi* contemporary practice left much to be desired. The effect of ethical teachings is more discernable in their practical life style than the teachings. This goes a long way to display their commitment to the cause of Islam and their demonstration of Sufism parse.

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⁴⁶ A. B. Al-Mustafa, *Kashf' Al-Ghita' wa Ra'ib fi Dhikr Anwa' Mafatih al-Ghaib*, "MS", C.I.S., 4/3/31, f.9a.

⁴⁷ It is one of many arguments they use in their public preaching sermons partially meant to enlighten the Muslims on innovations contained by *Sufi* Orders

Gidado, A. B. *Al-Ikhtifā' li ahl al-Ta'assī Wa al-Iqtidā'*.

Lema, G. B. *Raudu'l Jinan*, Local Print.

Al-Mustafa, A. B., *Kashf' Al-Ghitā' wa Ra'ib fi Dhikr Anwā' Maḥātib al-Ghaib*, "MS", C.I.S., UDUS, 4/3/31, f.9a.

A Sight on E-learning Factors: Emerging Universities

Ahmed Dheyaa Basha*

* Faculty of Computer Science & Information Technology, University of Sumer

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Abstract- E-learning has been used by numerous higher learning institutions around the globe to teaching and learning activities numbers of factors how effect or influence on e-learning especially in Emerging universities (EU). This paper attempts to sight on important e-learning factors in (EU). Framework has been proposed to investigate or explain the simultaneous effects of important factors on each other and their collective through e-learning in (EU). Questionnaire in this paper gathered was analyzed by using structural equation modeling (SEM) in SPSS AMOS. All respondents were instructors from University of Sumer-Iraq.

Index Terms- Organizational Climate, Community, Subject, Tools, Object.

I. INTRODUCTION

Several researchers such as Al-Azawei., (2015); and Harb, (2013) suggested and provided a number of factors as a instructions for future work on e-learning in many public universities, but many previous studies did not make test or an attempt to explain and test the factors simultaneously (directly and indirectly effect). In addition, they did not attempt to explain the simultaneous effects of these factors individually and collectively in (EUs). For instance, many studies proposed framework for e-learning with factors such as proposed by Khan (2009), Violato, et al.,(2007), Elameer (2017), Mutiaradevi (2009) etc., but no researcher has attempted to explain ad investigate a modeling of these factors and the simultaneous effects of these factors individually. Table 1 shows Critical Factors in E-Learning environment in previous studies. Therefore, this study using simultaneous analysis of several factors has been carried out, a new framework on e-learning readiness has been proposed. The analyses point out that (a) organizational climate has significant direct effects on subject and tools, and another significant indirect effect on engagement through subject and tools, (b) while organizational climate does not have direct effect on culture, in addition no indirect effect on engagement with culture, (c) also the subject/individual has significant direct effects on engagement and tools, and a significant indirect effect on engagement through tools, (d) this study explained the culture has significant direct effects on subject and engagement, and indirect effect on engagement through subject, (e) moreover, culture has no significant direct effect on tools and no indirect effect on engagement through the tools, and (f) tools have significant direct effects on engagement. All respondents were instructors from University of Sumer as a (EU) in Iraq. A stratified sampling technique was used to identify

the sample. Data gathered was analyzed by using structural equation modeling (SEM), also several techniques of analysis were employed to exam the hypothesized model and the relationships among the factors of study. Thus, this study seek to investigate nine factors aforementioned (that have been identified and gathered from the literature review) and classified in Organizational Climate, Community, Subject, Tools, Object to study the simultaneous effects of these factors whether were individual and collective in EUs.

Table 1: Critical Factors in E-Learning Environment

Authors	Subjects	Factors
Khan(2005)	E-learning QUICK Checklist	› Institutional factors
		› Management factors
		› Technological factors
		› Educational factors
		› Ethical factors
		› Interface design factors
		› Evaluation factors
Mutiaradevi (2009)	Measurement of e-learning	› Technological skills
		› Equipment/infrastructure
		› Online learning style
		› Attitude
		› Human resources
		› Cultural
		› Environmental
		› Financial
Critical Factors in e-learning environment (Adapted from Duong, 2011)		
Elmehdi (2013)	Factors Influencing Faculty and Students' Acceptance of E-learning Tools	› Technology (Internet access)
		› Material
		› Methods of teaching and learning
Chin & kon (2014)	Key Factors for fully Online E-learning Mode	› Pedagogy
		› Management
		› Resource support
		› Ethical (Students' Language Capability)
		› Technology (Internet connection)
		› Institutional support student)

II. CONCEPTUAL FRAMEWORK AND FACTORS OF STUDY

The nine factors in this paper, called technological skills, equipment/infrastructure, online learning style, attitude; human resources, cultural; environment, financial and engagement readiness included in conceptual framework explained in Figure 1 based on tools, subjects, community, object components and organizational climate. These factors would be divided and classified as the following:

- 1) Subject/ Individual Readiness for Change involving attitude and online learning style factors.
- 2) Community/ Societal Readiness involving the cultural factor.

- 3) Tools are Technological Readiness involving equipment/ infrastructure, technology skills, and human resource factors.
- 4) Object is related to engagement readiness factor.
- 5) Organizational climate involving financial and environmental factors.

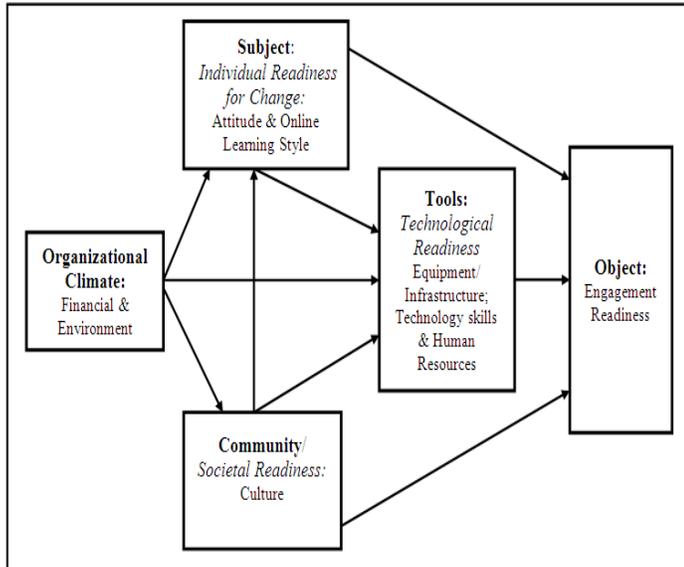


Figure 1. Conceptual framework and factors of the study

A. Problem Statement

Many factors have been identified in different studies about e-learning readiness for several countries, but no study yet has exam or investigate the simultaneous effects of these factors individually and collectively. this study is devoted to effects of these factors individually and collectively (directly and indirectly) for e-learning based on nine dimensions for instructors, namely technological skills, equipment/infrastructure, online learning style, attitude, human resources, cultural, environmental, financial, and engagement readiness (EUs).

B. Research Objectives

- 1) To examine how organizational climate has a direct effect on factors of subject, tools, and culture readiness, and an indirect effect on engagement through subject, tools, culture as mediating variables in the e-learning environment of (EUs).
- 2) To examine how subject has a direct effect on tools and factor engagement and indirectly on engagement through the tools in e-learning environment of (EUs).
- 3) To examine how factor culture has a direct effect on subject, tools, and engagement and an indirect effect on engagement readiness through subject and tools as mediating variables in e-learning environment of (EUs).

- 4) To examine how factors tools have a direct effect on engagement in e-learning environment of (EUs).

C. Research Questions

- 1).Does factors organizational climate have a direct effect on subject, tools, and culture, and an indirect effect on factor engagement through subject, tools, culture as mediating variables in e-learning environment of (EUs)?
- 2). Does factors subject have a direct effect on tools and engagement and indirectly on engagement through the factors of tools in e-learning environment of (EUs)?
- 3). Does factor culture have a direct effect on subject, tools, and engagement and an indirect effect on factor engagement through subject and tools as mediating variables in e-learning environment of (EUs)?
- 4). Does factors tool have a direct effect on engagement in e-learning environment of (EUs)?

III. SEARCH TECHNIQUE

In this paper, the population refers to all instructors at the University of Sumer. They were chosen from; involving different colleges have a total of more than 110 instructors. In this study, 30 samples were selected to be involved, with an average of 5 instructors from each college. However, from the 90 instructors identified, only 55 instructors responded the questionnaire. Then, out of this 90, another 18 cases of missing data were detected, resulting a final number of respondents as 72.

IV. RESEARCH INSTRUMENT

This study is identification of the research instrument. In this study, the instrument– a questionnaire - was adapted from the literature review. Five-point Likert scales, which were categorized as: 1. strongly disagree; 2. Disagree; 3. Neutral; 4. Agree and 5. Strongly agree.

V. RESULTS AND ANALYSIS

Reliability indicates the stability and consistency by which a survey questionnaire measures the construct, and helps to assess the goodness-of-fit of a measure (Alkarzon et al., 2014) suggested Cronbach's Alpha coefficient to determine the strength of the relationships among the items within each scale. In this paper, Cronbach's Alpha as a coefficient of internal consistency, was used to measure the reliability of the instrument through a score ranging from 0 to 1. In this study 13 questionnaires were completed and returned. Table 2 shows the reliability results for the nine factors used in the questionnaire. The analysis indicates that the reliability values or the Cronbach's Alpha values are greater than 0.70.

Table 2: Reliability Results from the Pilot Study in EUs

No.	Factors	Cronbach's Alpha	Number of Items
1.	Tools		
1.1	Technological skills readiness	.804	7
1.2	Equipment/infrastructure readiness	.861	8
1.3	Human Support Personnel	.864	5
	Management	.840	4
2.	Subject(Individual Readiness of Change)		
2.1	Attitude readiness	.885	24
2.1.1	Confidence	.808	6
2.1.2	Enjoyment	.793	5
2.1.3	Importance	.828	2
2.1.4	Motivation	.837	4
2.1.5	Self-Development	.881	3
2.1.6	Anxiety	.822	4
2.2	Online learning style readiness	.848	8
3.	Organizational Climate		
3.1	Environmental readiness	.899	4
3.2	Financial readiness	.854	7
4.	Community/ Societal Readiness		
4.1	Cultural readiness	.837	6
5.	Object (Engagement Readiness)	.820	15
5.1	Intellectual readiness	.896	3
5.2	Social readiness	.829	3
5.3	Academic readiness	.838	3
5.4	Professional readiness	.833	3
5.5	Personal readiness	.858	3

A. Structural Equation Modeling Technique

structure equation modeling (SEM) is technique used in academic research Preacher (2008), because it allows for the estimation of a series and the performance of multiple regression in analysis (i.e., the regression including two or more independent variables together). SEM also has the ability to involve latent variables and account for measurement error in the estimation process. In this study SEM technique used in analysis. Confirmatory factor analysis (CFA) was conducted to estimate the quality of the structural reliabilities and designated factor loadings by testing the model fit between the proposed measurement models and the collected data. The result of a statistical test of the overall measurement model was accepted as the following $\chi^2 = 1954.124$, $df = 1458$, $\chi^2/df = 1.332$, $RMSEA = 0.029$, $CFI = 0.953$, $TLI = 0.950$, $NNFI = 0.953$. Figure 2 present the results of CFAs with the fit indices, which are recommended (AIRadhi, 2008; Alkarzon et al., 2014; Matar, et al 2011). In addition, all factor loadings have been statistically significant (t-value > ±1.96, p < 0.05), and standardized loading estimates ranged from 0.681 to 0.848 which are higher than 0.6. On the basis of the estimates of factor loadings, the measures included in the study can be considered as reasonable results that confirmed the existence of reflection of the underlying latent variables. Figure 2 summarizes the results of CFA for the overall measurement model.

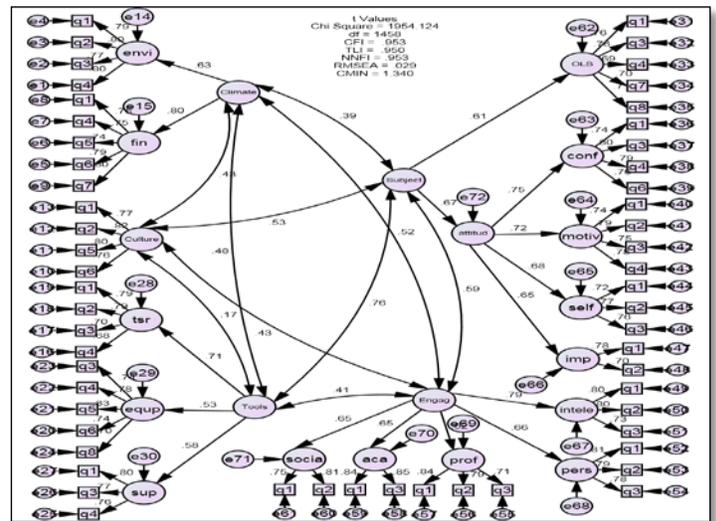


Figure 2: Overall measurement model

B. Assessment of the Structural Model

The structural model was based on the measurement model obtained in the previous section (CFA results) for the purpose to determine whether the theoretical relationships specific at the conceptualization stage are supported by the collected data. Five main latent constructs (Engagement, Culture, Subject, Tools, and Organizational Climate) and 56 observed variables were used to test the structural model which includes estimates of the path coefficients indicating the strength of the relationships between model constructs; and estimates of the R2 values, which represent the amount of variance in the dependent variable explained by the independent variables. It was found that for the proposed model presented an acceptable fit with the data ($RMSEA = 0.029$, $CFI = 0.953$, $IFI = 0.952$, $TLI = 0.974$; $\chi^2 = 1954.124$, $\chi^2/df = 1.340$). However, the proposed structural model had two non-significant paths, namely, between (1) Culture and tools, (2) organizational climate and culture explained in Figure 3.

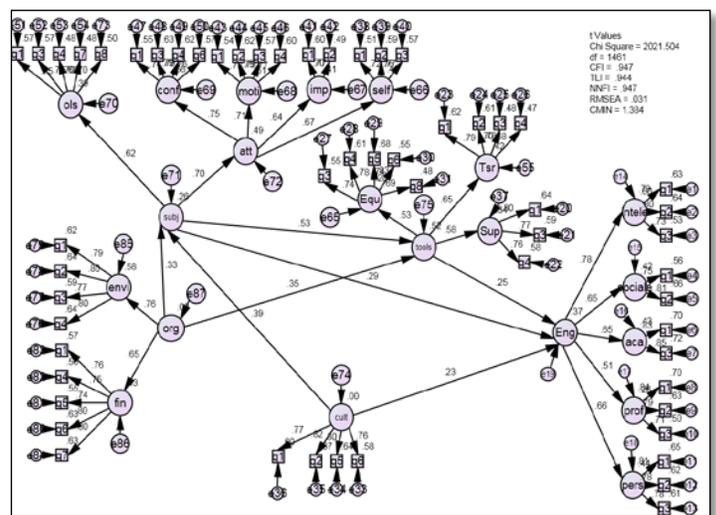


Figure 3: Structural model

C. Direct Effects

The results of the study as depicted in Figure 3, indicates that seven of the paths were significant in the structural model explained in Table 3.

Table 3: Parameters Estimation of the Structural Model (N=409)

Hypothesis	Hypothesized path	Std coefficients (β)	t-value	Sig
H1a	Organizational climate ---> Subject	.327	3.332	Supported
H1b	Organizational climate ---> Tools	.348	3.343	Supported
H1c	Organizational climate ---> Culture	.188	1.117	N.S
H2a	Culture ---> Subject	.392	4.946	Supported
H2b	Culture ---> Tools	.128	0.914	N.S
H2c	Culture ---> Engagement	.228	3.221	Supported
H3a	Subject ---> Tools	.527	4.443	Supported
H3b	Subject ---> Engagement	.289	2.027	Supported
H4	Tools ---> Engagement	.252	2.055	Supported

D. Indirect and Total Effects

As the structural model was a meditational model, the significance of the indirect effects was computed. As multiple mediators needed to be tested simultaneously, the analyses of the indirect effects employed the bootstrap estimate method as proposed by Preacher (2008). This method also allowed for the total effects to be computed. The result of the bootstrap analysis showed that all the indirect effects reached statistical significance explained in Table 4.

Table 4: Standardized Causal Effects for the Final Structural Model

Endogenous Variables	Determinant	Standardized Effects			Causal
		Direct	Indirect	Total	
Subject (R ² =0.263)	Organizational climate	.327	-	.327	
	Culture	.392	-	.392	
Tools (R ² =0.522)	Subject	.527	-	.527	
	Organizational climate	.348	.173	.521	
	Culture	-	.207	.207	
Engagement (R ² =0.373)	Subject	.289	.133	.422	
	Tools	.252	-	.252	
	Culture	.228	.165	.393	
	Organizational climate	-	.226	.226	

E. Final framework for e-learning readiness in EUs

The findings of the main study showed that the initially hypothesized model fit the observed data well. In addition to Evaluating the model fit, the coefficients between variables were examined. Some paths with significant coefficients were retained in the final model, and some paths with non-significant coefficients were removed from the model. And based on the structural model, it can be summarized that:

- 1). Organizational climate had direct effects on subject and tools and indirectly on engagement through subject and tools.
- 2). Subject had direct effects on the engagement and tools and indirectly on engagement through the tools.
- 3). Culture had a direct effect on subject and engagement and indirectly on the engagement through the subject.

Tools had a direct effect on engagement. The final framework for e-learning readiness among the instructors in EUs is shown in Figure 4.

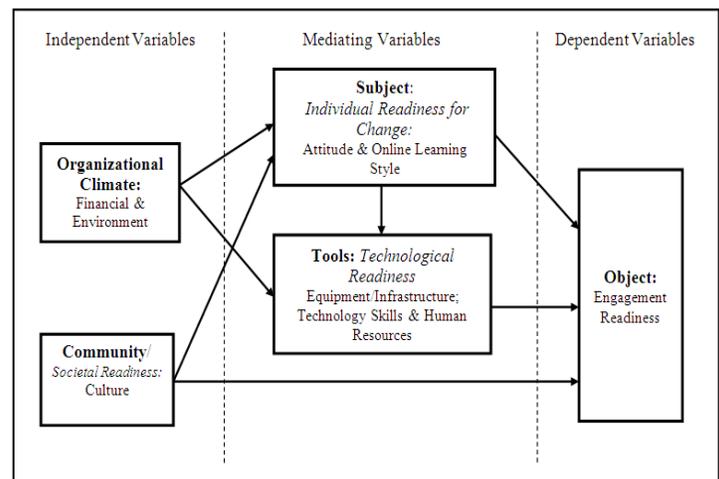


Figure 4: Final framework for e-learning readiness in EUs

VII. CONCLUSION

The results provided better understanding of the role of SEM, especially CFA as a sophisticated analysis method in modeling important factors and how those factors affect each other for e-learning readiness. These findings imply the need for further research on e-learning readiness. This study has also identified and improvement in future studies. This study Contributes to finding important factors which drive e-learning readiness in EUs.

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AUTHORS

First Author –Ahmed Dheyaa Basha, doctor in University of Sumer, Faculty of Computer Science & Information Technology, ALQul,aa 64003, Iraq, email: ahmed2009shh@yahoo.com

Response of the antioxidant system in *Oreochromis mossambicus* reared on gold nanoparticle fortified diet.

Shine.F¹., and A.Akhila Thomas¹, Shibu Joseph S.T², Dhanya Raj¹

¹Fisheries Biotechnology And Nanoscience Unit , Department Of Zoology, Fatima Mata National College, Kollam, Kerala, India. 69100

²P G and Research Department Of Chemistry, Fatima Mata National College, Kollam, Kerala, India. 69100

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ABSTRACT

Nanotechnology involves the application of materials at the nanoscale to new products or processes. The interest in nanomaterials is a result of the extreme dependence of properties (electronic, magnetic, optical, mechanical, etc.) on particle size and shape in the 1-100 nm regime. The 1-100 nm scale is of interest for biological interfaces because objects less than 12 nm in diameter may cross the blood-brain barrier [Sonavane, et al; 2008] and objects of 30nm or less can be endocytosed by cells [Connor, et al; 2005]. However the impact of these nanomaterials on environmental health remains unclear. (Maynard, et al; 2006). An increasing number of scientific reports have appeared in the last decade that highlight this issue, with the goal of understanding the interactions between different types of nanoparticle and cells as function of size, shape, and surface chemistry of the nanomaterial [Lewinski, et al; 2008]. The environmental risk assessment of these new materials involves the identification of associated hazards as well as the routes leading to exposure. Currently large gaps exist in our knowledge and understanding of the toxicity and exposure of nanomaterials for aquatic organisms, which hinder their risk assessment. Presently ecotoxicological studies with gold nanoparticles are rather limited with only a few reports of aquatic organisms. Hence, in the present study, an attempt was made to assess whether there is any toxic effects on synthetic and biologically synthesized gold nanoparticle supplementation on fish *Oreochromis mossambicus*. Gold nanoparticle were prepared using 0.3 M HAuCl₄·3H₂O (Sigma-Aldrich). Synthetic gold nanoparticles were prepared by sodium borohydride reduction method and for the green synthesis, aqueous extract of *Ocimum sanctum* and *Curcuma longa* were used. Synthesis of gold nanoparticles were confirmed from the UV-Vis study of surface plasmon resonance property of the colloidal solution. Juveniles of *Oreochromis mossambicus* in the range 7+- 0.35cm and 5+-0.62gm were collected from ADAK, Varkala, quarantined and stocked at 20 fish/1000L tanks and maintained at laboratory conditions. Experimental diet was prepared by incorporating 10ml of biogenic and synthetic gold nano solution per 100gms of basal feed. Non-treated control diets and biogenic gold nanoparticle incorporated diets too were prepared. The experimental schedule was for six weeks and the fishes were fed at 2% of body weight twice daily. The biological effect was assessed in terms of selected antioxidant indices. The biological effect was assessed in terms of expression levels of antioxidant enzymes Catalase, Reduced glutathione, LDH and Lipid peroxidation.

Index terms: *Embllica officianalis* , Gold nanoparticle Green synthesis, Nanotechnology.

1. INTRODUCTION

The recent development and implementation of new technologies have led to new era, the nano-revolution which unfolds role of plants in bio and green synthesis of nanoparticles which seem to have drawn quite an unequivocal attention with a view of

synthesizing stable nanoparticles (Kavitha, *et al.*). The possibilities of employing plants in the deliberate synthesis of nanoparticles have burgeoning interest as an important source towards reliable and environmentally benign method of metallic nanoparticles synthesis and its characterization. Nanoparticles have diverse applications in life sciences such as drug development, protein detection and gene delivery. Drug targeting through nanoparticles may improve therapies yet a thorough understanding of the feature that regulates the effect of carrier nanoparticle is needed to translate this approach into the clinical application. Currently large gaps exist in our knowledge and understanding of the toxicity and exposure of nanomaterials for aquatic organisms, which hinder their risk assessment. Therefore, increased research is warranted on various toxicological issues related to nanoparticles. Nanofeed applications could be used to improve the delivery of micronutrients or unstable ingredients. In the present study, the plant selected for biogenesis of gold solution is *Curcuma longa* and *Ocimum sanctum*. The objective of the study is to determine the effects of biogenic gold nanoparticle in the aquatic environment on *Oreochromis mossambicus* with emphasis on selected antioxidant indices. The biological effect was assessed in terms of expression levels of antioxidant enzymes Catalase(CAT), Reduced glutathione(GSH), Lactate dehydrogenase(LDH) and Lipid peroxidation.(LPO).

2. MATERIALS AND METHODS

2.1 Synthesis of gold nanoparticles

Synthetic gold nanoparticles are prepared by the reduction of Auric chloride (HAuCl₄). After addition of reducing agent (here sodium borohydride), the solution is rapidly stirred and it leads to the reduction of gold ion (Au³⁺) to neutral gold atom (Au⁰) and the continuation of the operation will turn out all the gold ions to neutral atoms and the solution becomes supersaturated. An addition of sodium borohydride saw an immediate change in the solution colour from yellow to purple (Fig: 1, 2, and 3). Tri sodium citrate is used as capping agent. The formation of colloidal gold nanoparticles was investigated using UV-Vis absorption. In the present study, green process for the production of gold nanoparticles uses direct interaction of HAuCl₄ with aqueous extract of *Curcuma longa* and *Ocimum sanctum* in the absence of manmade chemical and thus satisfies all the principles of 100% green chemical process. Various phytochemicals present in the plant extracts presumably responsible for making a robust coating on gold nanoparticles and thus rendering stability against agglomeration. Absorption measure indicated that plasmon resonance wavelength of synthetic gold nanoparticles and green synthesized gold nanosolutions from both the plant extracts is 520nm. Experimental diets were prepared by incorporating 10 ml of the above mentioned concentrations of gold nanosolution per 100gms of basal feed prior to pressure pellatisation.



(Fig:1)

(Fig:2)

(Fig:3)

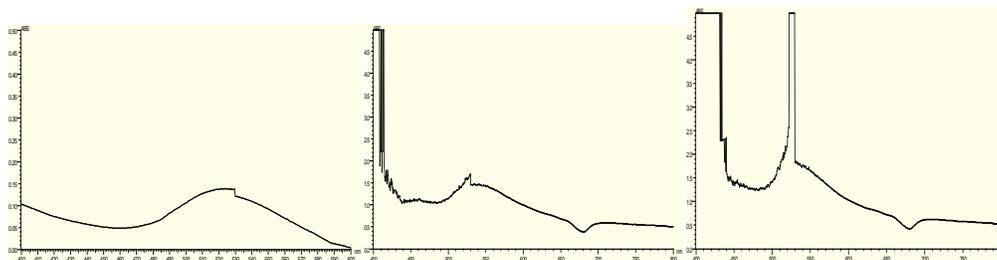
(Fig:4 Synthetic gold nanoparticle, Fig:5. Biogenic gold prepared from *Curcuma longa* , Fig:6.. Biogenic gold from *Ocimum Sancta*)

2.2 UV-Vis Spectrophotometric analysis of Gold Nanoparticle:

Spectrophotometry is an important aspect of characterization of gold nanoparticles. With increase in particle size, the absorption peak shift to longer wavelength and the width of the absorption spectra is related to the size distribution range. Generally gold nanoparticles display a single absorption peak in the visible range between 510-550 nm because of the surface plasmon resonance and show heavy absorption of visible light at 520 nm. This gives purple colour .

The appearance of violet colour is the evidence of the formation of gold nanoparticle in the reaction mixture and the efficient reduction of Au³⁺ to Au⁰ (Fig: 1, 2 and 3)). The formed colour solution allowed to measure absorbance against wavelength to confirm the formation of gold nanoparticle. The corresponding UV absorption spectra of the nano gold solutions in experiment is shown in (Fig: 4, 5 and 6). The absorption is a typical gold surface plasmon vibration excitation for colloidal gold nanoparticles when they interact with electromagnetic radiation. In the optical absorption spectrum of the resultant nanoparticles the absorption wavelength of gold nanoparticles were observed at 520 nm.. The absorption spectrum of both the green synthesized nanoparticles is shown in fig 5 and 6. In both the reaction mixtures the observed intensity of SPR peak is more with small sharpness in the peak suggesting complete

reduction of gold nanoparticles. The reasonable narrow absorption peak indicated that the particles were not aggregated and the capping was effective. Phytochemical constituents in the plants and spices extract like essential oils (terpenes eugenols etc), polyphenols and carbohydrate contain active functional groups, such as hydroxyl aldehyde and carboxyl units play important role for reduction of HAuCl₄ to gold nanoparticles. Gold nanoparticles produced using phytochemicals or other extract components remain stable for prolonged period.



(Fig:4)

(Fig:5)

(fig:6)

(Fig 4. UV-VIS Spectrum of Chemically reduced GNP, Fig 5.UV -VIS Spectrum of nano *Ocimum sanctum* , Fig:6.UV -VIS Spectrum of nanocurcuma)

2.3.Experimental design

Oreochromis mossambicus juveniles belonging to the brood stock were obtained from the ADAK centre,Varkkala,TVPM,Kerala.Sixty fishes belonging to both sexes and having an initial length of about 8 - 9 cm and 6-7 gm weight were selected. The experimental setup consists of six tanks with 10 fishes per 10 litre of water. Basal feed was prepared as out lined by Hardy et al. (1978). The fish in each set was fed with 2% body weight per day. First tank served as control .In the second and third, tanks fishes were fed with diet containing gold nano solution prepared using *Curcuma longa* and *Ocimum sanctum* extract and the fourth and fifth tanks were fed with aquous extract of *Curcuma longa* and *Ocimum sanctum* containing diets.Sixth tank was maintained on chemically reduced gold nanoparticle incorporated diet. After 30 days of treatment,major biochemical changes with respect to selected enzymes were estimated.

2.1.Parametres investigated:

1.Assay of Catalase

Catalase level in different tissues were determined using the method of Maehly and Chance 1955. The estimation was done by spectrophotometry following the decrease in absorbance at 230 nm. Specific activity was expressed as International units/mg protein.

2.Assay of Reduced glutathione

Reduced glutathione was estimated by the method of Beutler *et al.* (1963). Absorbance of reactants was read at 412 nm against blank.. Values were expressed as μg of reduced glutathione μg protein-1.

3.Assay of Lactate Dyhydrogenase(LDH)

Lactate Dyhydrogenase(LDH) was assayed according to the method of King(1965). The enzyme activity was expressed as μ moles of pyruvate liberated / hr / mg protein

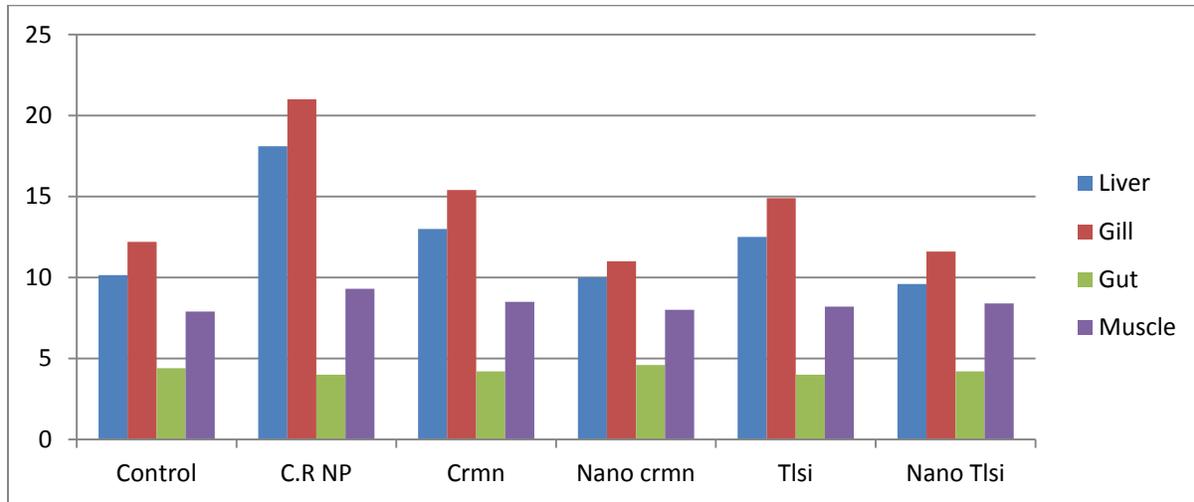
4.Assay of lipid Peroxidation(LPO)

Lipid peroxidation(LPO) was determined by the method of Utley,*et al*;(1967). Absorbance of the reactants was read at 535 using a reagent blank. Values were expressed as nmoles of thiobarbituric acid reactive substances (TBARS) formed hour-1mg protein-1.

3.RESULTS

3.1.Catalase(CAT)

Fig:1 Effect of biogenic gold nanoparicles on CAT activity in selected tissues of *Oreochromis mossambicus*



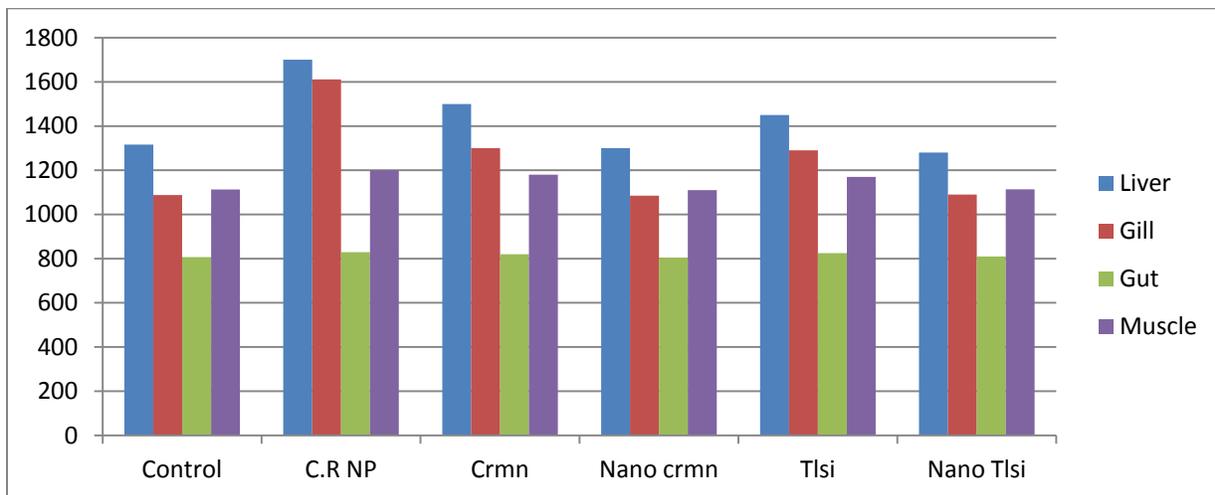
(CRNP:Chemically Reduced Nanoparticle, Crmn:Curcumin(*Curcuma longa*)Nano Crmn:Biosynthesized Nanocurcumin.,Tlsi :Tulsi(*Ocimum sanctum*),Nano tlsi:Nano Tulsi)

Each value represents mean \pm SD of 3 separate experiments.Values were represent as u/mg of protein

In the present study catalase activity in different tissue of *Oreochromis mossambicus* treated with chemically synthesized and green synthesized (using aqueous solution of *Curcuma longa* rhizome extract and *Ocimum Sanctum* leaf extract)showed marked variations (Fig:1 ,Table: 1) compared to control groups.CAT activity was significantly high ($p < 0.05$) in gills of *O.mossambicus* treated with chemically synthesized gold nanoparticle encapsulated food fed groups compared to control groups and groups treated with different plant extracts. Comparison between the nanocurmin and nano tulsi fed groups ,there was no significant difference in CAT activity and the measures comes closer to that of control groups.Response of biogenic nanotreated groups suggests that they are more potent in CAT activity.

3.2.Reduced glutathione(GSH)

Fig:2 Effect of biogenic gold nanoparticles on Reduced Glutathione(GSH) content in *Oreochromis mossambicus*



(CRNP:Chemically Reduced Nanoparticle, Crmn:Curcumin(*Curcuma longa*)

,Nano Crmn:Biosynthesized Nanocurcumin.,Tlsi :Tulsi(*Ocimum sanctum*),Nano tlsi:Nano Tulsi)

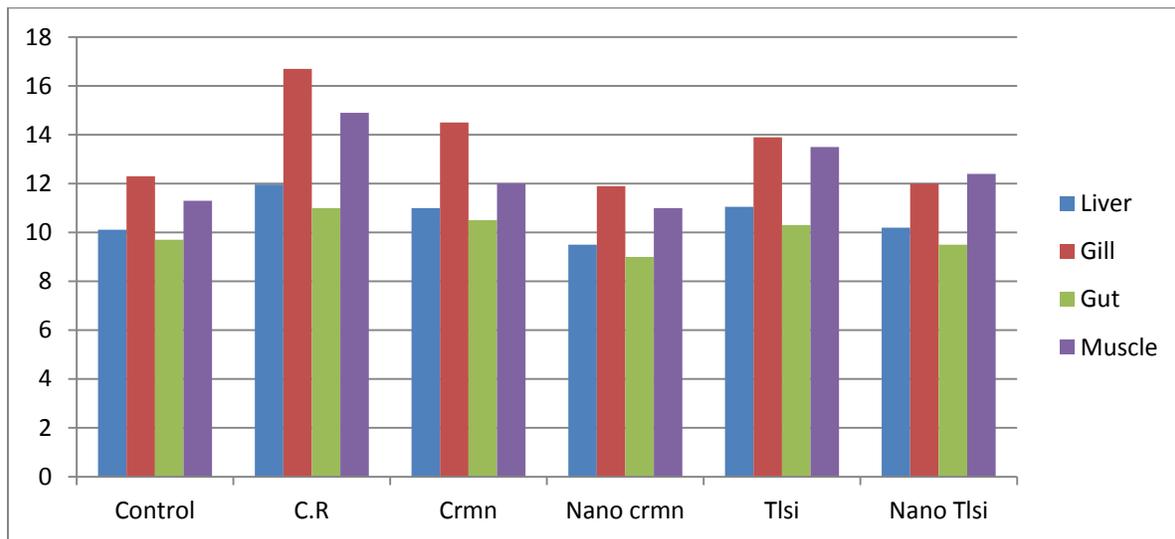
Each value represents mean \pm SD of 3 separate experiments.Values were represent as u/mg protein

Figure 2 and Table 2 shows the effect of synthetic ,biogenic gold AuNPs and aquous extract of *Ocimum sanctum* and *Curcuma longa* on reduced glutathione concentration in various tissues in *O.mossambicus*

The chemically synthesized AuNPs caused a statistically significant increase in reduced glutathione ($P<0.05$) on tissues under study when compared to the effects of green synthesised gold nanoparticles .The increase in reduced glutathione was the highest in liver followed by muscles.In the present study, synthetic gold nanoparticle treatment caused a significant increase in reduced glutathione which may be due to increase in lipid peroxidation in the liver .Increased cellular GSH levels can confer cells resistance and decreased cellular GSH levels can sensitize cells to the killing effects (Chiba,*et al.*, 1996; Yang,*et al.*, 2000).

3.3 . LACTATE DEHYDROGENASE (LDH).

Fig:3 .Effect of biogenic nanoparticles on LDH activity in *Oreochromis mossambicus*.



(CRNP:Chemically Reduced Nanoparticle, Crmn:Curcumin(*Curcuma longa*)

,Nano Crmn:Biosynthesized Nanocurcumin.,Tlsi :Tulsi(*Ocimum sanctum*),Nano tlsi:Nano Tulsi)

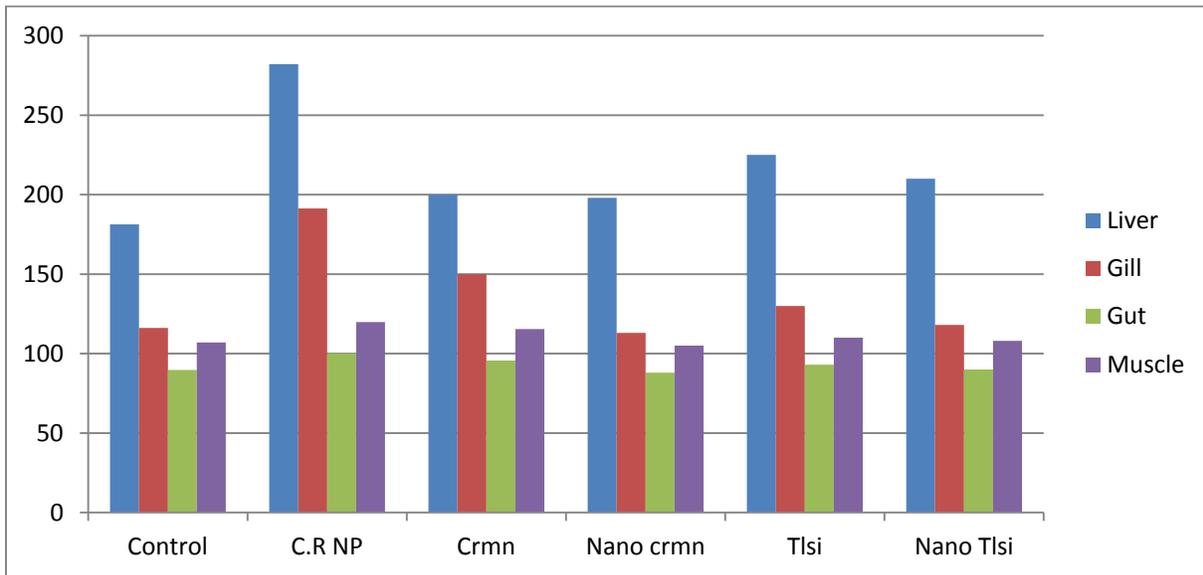
Each value represents mean \pm SD of 3 separate experiments.Values were represent as u/mg of protein.

There are changes in the LDH level among the treated groups and control.Significantly high ($P<0.05$) LDH level is found in all the tissue of groups treated with synthetic nanoparticle fed groups.Among the tissues, gill and muscle showed significantly elevated LDH level.Comparison between the groups treated with nanocurcumin and nanotulsi,nanocurcumin treated group shows better LDH profile.LDH measures of aquous extract of *Curcuma longa* and *Ocimum sanctum* are closer to the control.

3.4 LIPID PEROXIDATION(LPO)

Fig:4 Effect of biogenic nanoparticles extracts on Lipid peroxidation (LPO)in

Oreochromis mossambicus



Each value represents mean \pm SD of 3 separate experiments

Values were represent as n mole/mg protein

In the study LPO values are found to be significantly high ($p < 0.05$) in all the tissues especially in liver in the groups supplemented with synthetic nanoparticle incorporated food. The data suggests that expression of Lipid peroxidation is nill in nanocurcumin and nanotulsi fed groups. The level of lipid peroxidation in *Curcuma longa* and *Ocimum sanctum* groups seems to be those values of control.

4. DISCUSSION

The application of nanotechnology in biology encompasses development of nanomaterials for delivering and monitoring biologically active molecules, disease staging, therapeutically planning, surgical guidance, neuro-electronic interfaces, and electronic biosensors (Huang *et al.*, 2010). However, it is also essential to understand the advantage of green synthesized gold nanoparticles over chemically synthesized nanoparticles on the biological system. Oxidative stress is a causative factor for many diseases and underlying pathologies. In this study, chemically synthesized gold nanoparticles were found to induce significant oxidative stress in the selected tissues of fishes. Oxidative stress plays important roles in cellular signaling, inflammatory, and genotoxic and proliferative responses (Knaapen, *et al.*, 2004, Zhong, *et al.*, 1997). Nanoparticles have the potential to interact with the biological system and cause undesirable effects. One of these damaging effects could be the disturbance in the natural balance between oxidative stress and antioxidant defense indices which in turn can lead to various pathologies.

To cope with elevated oxidative stress, cells mount protective or injurious responses. For instance, cells activate enzymatic and non-enzymatic antioxidant defense mechanisms like glutathione peroxidases, catalases, etc (Huang, *et al.*, 2010). Oxidative stress has been identified as a likely mechanism of nanoparticle toxicity (Li, *et al.*, 2008).

Figure :1 represent the changes in the action of CAT in different tissues of *O. mossambicus*. Catalase is the enzyme responsible for dissipation of hydrogen peroxide formed during oxidative stress. The results show that there is elevated CAT activity in synthetic gold nanoparticle fed groups compared to control which suggests occurrence of oxidative stress. CAT activity was elevated for the detoxification of increased H_2O_2 . CAT is the most abundant peroxisomal enzyme. since peroxisomes play key role in many cell functions, it may have multiplied in stress. It may be the one of the reason of increase in CAT activity. Increase of CAT is reported in

some fish species under oxidative stresses (Gull,*et al*;2004,Zhang,*et al*;2004).The response patterns of groups treated with aqueous extract of *Curcuma longa* and *Ocimum sanctum* are very closer to the control .The data reveals gill showed highest antioxidant activity in the groups treated by synthetic gold nanoparticles. This suggests the adaptive response to protect the fish from free radical toxicity induced by synthetic gold nanoparticles. In contrast to these results, biogenic nanoparticles prepared from aqueous extract of *Ocimum sanctum* and *Curcuma longa* caused no significant changes in the catalase activity in all the tissues studied. Since catalase was not significantly altered by biogenic nanoparticle treatment. It reveals that H₂O₂ might not have been generated in significant amount by the biogenic AuNPs to elicit an alteration in the catalase activity. Therefore, the biogenic gold nanoparticle in this study may not be toxic to all the organs in fishes. These results are in agreement with the study of Shukla,*et al*;(2005) indicating their potential for application in nanoimmunology, nanomedicine, and nanobiotechnology.

Increased cellular GSH levels can confer cells resistance and decrease cellular GSH levels can sensitize cells to killing effects.(Chilba,*et al*;1996,Yang,*et al* ;2000.).GSH is a major cytosolic low molecular weight sulphhydryl compound that acts as a cellular reducing and a protective reagent against numerous toxic substances. Liver and muscle show elevated GSH level when treated with synthetic gold nanoparticles compared to control.(Fig 2.)As a result of scavenging the ROS,GSH is oxidized and form glutathione protein disulphide. Since there is high consumption of GSH, to manage the oxidative stress, cells try to reduce or synthesize more GSH. Thus reduced GSH content is a biological index to indicate exposure to contaminants. Plots of biogenic nanoparticles from *Ocimum sanctum* and *Curcuma longa* extracts suggests that they produce no oxidative stress and they are more potent than their non nano counter parts. Since GSH resist the reactive oxygen toxicity .The different level of Total Glutathione can serve as marker of exposure to the substances which disturb piscine oxyradicals.

LDH enzyme patterns are portrayed in Fig :3.In the study elevated levels of LDH in synthetic nanoparticle treated groups reveals the increased permeability of the cells and cellular leakage .An increase in level of LDH reflects damage to tissues and oxidative stress. It was observed that biogenic gold nanoparticles from both the plant extracts (*Curcuma longa* and *Ocimum sanctum*) have reversal effects on the levels of LDH.The tissues of groups treated with *Ocimum sanctum* and *Curma longa* also exhibit a better LDH profile.

LPO has been shown to cause various negative effects in terms of cellular integrity in the membranes of the cells as well as other changes such as the product of pro inflammatory agents and toxic substances.(Greenberg,*et al* ;2008).LPO is commonly used as an indicator of oxidative stress in cells and tissues.(Botsglou *et al*;1991).The level of LPO is compared among the different treatment groups of *Oreochromis mossambicus* in Fig:4.The study reports indicates that fish exposed to synthetic AuNPs induce a greater risk of oxidative stress with increased levels of Lipid peroxides.The LPO level is found high in liver. Since liver is an important organ for storage of iron, it may be susceptible to lipid peroxidation than other tissues. Gold nanoparticles are taken up by the Kupffer cells of the liver and their bioaccumulation is regulated by the reticuloendothelial system.The LPO levels did not show much difference between control and biogenic gold nanoparticle fed groups.The group treated with plant extracts alone also shows results that don't vary much from control.

All the parameters showed increase when treated with synthetic nanoparticles compared to the control groups and groups treated with green synthesized nanoparticles. In this study, liver and gill was the organ most sensitive to the effects of synthetic gold nanoparticles. Liver of synthetic gold nanoparticles treated fish showed a significant increase in lipid peroxidation and reduced glutathione and gills of the same group show increase in CAT and LDH activity when compared with the fishes of other groups. These results points to the fact that synthetic nanoparticles induce tissue damage. No evidence indicates that biogenic gold nanoparticles cause toxicity at the cellular level. The response patterns suggests biogenic nanoparticles from *Ocimum sanctum* and *Curcuma longa* are more potent than normal *Ocimum sanctum* and *Curcuma longa* aqueous extracts as an anti oxidant and also reveals nano form of the plant extracts increases the bio availability of the constituents present in them. The versatile phytochemical mediated green nanotechnological process has been shown to be effective in both the generation and stabilization of non-toxic gold nanoparticles for direct applications in a myriad of diagnostic and therapeutic applications. The study reveals the interaction of synthetic Nanoparticles with biosystems plays an important role in triggering toxicity through a range of mechanisms, including membrane perturbation and resultant oxidative stress.

The better enzyme profile of groups treated with biogenic nanoparticles can be attributed to the bio transformed gold nanoparticle present in it. The plots of groups treated with synthetic nanoparticles clearly indicates the toxic effect of chemical used for AuNP synthesis. The plant mediated stabilized and capped gold nanoparticles may cross the barrier of cytotoxicity This highlights the importance and advantage of green synthesis of nanoparticles over chemical reduction. Biogenic nanostructures have been considered to have better biocompatibility than the chemically synthesized nanostructures.

5.CONCLUSION

Gold nanoparticles have a wide range of applications in various fields. It is therefore essential to study their interaction with the biological system. In the present study, the effect of gold nanoparticles was studied on oxidative stress and antioxidants in various tissues of fish.

The synthetic gold nanoparticles used in this study caused a significant change in the oxidative stress and antioxidant defense indices in all the tissues examined. From the results it can be concluded that the activities and expression levels of antioxidant enzymes and oxidative stress can be used as biomarkers to evaluate the influence of nanoparticles on the biochemical pathway and enzymatic function in *Oreochromis mossambicus*. The activity of antioxidant may be increased or inhibited under chemical stress depending on the intensity and duration of stress applied. Thus, it is hoped that, further research in the fish model developed will strengthen and expand the knowledge on biogenic gold nanoparticle. Studies in this direction could help to shape the future of aquaculture. Green synthesized gold nanoparticles showed less toxicity compared to other groups. Thus it shows that biogenic gold nanoparticles can be looked up as an environmentally benign replacement to the toxic chemical methods for the synthesis of nanostructures and as promised candidates for biomedical applications. Our results have demonstrated the property of phytochemicals, present in *Ocimum sanctum* and *Curma longa* to reduce the gold metal, to the corresponding gold nanoparticles. The versatile phytochemical mediated green Nano technological process has been shown to be effective in both the generation and stabilization of non-toxic gold nanoparticles for direct applications in a myriad of diagnostic and therapeutic applications

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AUTHORS

Shine.F., Fisheries Biotechnology And Nanoscience Unit , Department Of Zoology, Fatima Mata National College, Kollam, Kerala, India. 69100

A.Akhila Thomas¹, Fisheries Biotechnology And Nanoscience Unit , Department Of Zoology, Fatima Mata National College, Kollam, Kerala, India. 69100

Shibu Joseph S.T². P G and Research Department Of Chemistry, Fatima Mata National College, Kollam, Kerala, India. 69100

,Dhanya Raj¹ Fisheries Biotechnology And Nanoscience Unit , Department Of Zoology, Fatima Mata National College,Kollam.

Cultural Adoption: A study of International Students Cultural Adoption and Educational Evaluation of Wuhan Textile University.

Rakibul Hasan Raki*, Syed Shakil Ahmed**, Md. Eusuf Amin***, Shafikul Islam****

* Department of Accounting, Wuhan Textile University

** Department of Logistic Engineering, Wuhan Textile University

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Abstract: One of the main educational aims of the internationalization of higher education is to organize students to purpose in an international and inter-cultural context. Annually a huge number of international student were coming Chinese college and universities for their higher education which requires them to adjust to a new environment a new culture, often accompanied by a cultural shock experience. The study focused on current situation of international student and cultural adoption of international students and educational evaluation. This paper investigates and identifies some of the major factors affecting student's adoption of culture and learning system in China and we also investigate the educational evaluation about WTU's exiting students. For this paper we made a survey Questionnaire in Wuhan Textile University. We made this Questionnaire in several parts like family background, past experience, current situation, studying, living, future planning and also cultural adoption. The sample consisted of 104 international students in Wuhan Textile University. Descriptive statistics and multiple discriminant analyses were employed for data analysis. Cultural variety on university campuses creates best social opportunities for inter-cultural learning and its one of the major issue for an international student.

Key Words: International students, Cultural adoption, Academic performance Communication, internationalization, Evaluation of WTU education.

INTRODUCTION:

International students mean starts on a great adventure. They were flying to other countries anticipating to enlarging their Academic knowledge as well as their personal knowledge of the world. Adventures can be scary, and they can be face with the unexpected. Some international students might overcome unwanted situation and adjust insignificant cultural differences, while others may hide their inconvenience and endeavor to mix in, leading to continued confusion.

This investigation focused the adjustment procedure and culture shock involvement of international students in China by taking a gander at similarities and differences among international students at Wuhan Textile University considering the factor of principle effect of cross-cultural situation And cultural shock they encountered. The Chinese higher education market is huge, and the worldwide market for brilliant international students is progressively competitive [1]. Ministry of Education (MOE) has additionally covenanted to set up a two-sided understudy's trade program, that over the forthcoming years annually year china send 2500 Chinese students to go abroad and supports 10,000 foreign students to study in china. This pipeline of two-sided trade may make ready for outside students from the Belt and the Road nations, who have as of now profit by special government approaches. Beijing presently offers 10,000 places every year for students whose nations of origin are distinguished as a piece of one belt one street. This program has contributed in excess of 200,000 understudies from 64 of the 68 Belt and Road nations. In 2012, China's authorities reported an objective of turning into a worldwide instruction center point, with an objective enlistment of 500,000 global understudies at all levels of training by 2020. From that point forward it has pulled in a huge number of understudies from crosswise over Asia, Europe, Africa, and the Americas. By any pertinent measure, the nation has gained huge ground against its objective, and seems ready to make considerably more. As indicated by information from the China Scholarship Council and Project Atlas, international enrollments dramatically increased from 2007 to 2015, when they achieved 397,635 worldwide students. China's Ministry of Education expresses that those numbers outperformed 400,000 out of 2016, making China the third most famous goal nation for international students after the U.S. also, the United Kingdom.

Going to another nation can be confused and astonishing. Regardless of whether you are contemplating in a nation with the comparable first dialect as your own or not, adjusting to another culture accompanies numerous troubles. One of the real things for worldwide understudy is encountering "culture shock." The purpose of this study is to find out the current situation of international students and also the cultural taking experience of international students in order to get a better understanding of the issue involved in this process[2]. The study also analyze how level of self-confidence, social network, and cultural background influence international students, adjustment to the Chinese culture.

LITERATURE REVIEW:

Every human being is an exceptional cultural being as a result of our nurture? And our immediate culture [2]. Ethnicity, religion, language, childrearing practices and norms of cultural subgroups within our advanced culture shape us and our awareness of those outside of our defined culture. Strong relations to our own ethnicities and customs within our groups clearly separate us from

other cultures, and meet with a new culture grounds reactions that may affect us in many ways. International students in abroad go through a new cultural experience that can reason what the literature calls culture shock, which involves more or less undecorated symptoms based on how well International students are able to adapt to the culture and handle with accompanying difficulties.

Individualism and collectivism are very common descriptors of culture, but the role of language as part and medium of culture. Hofstede [3] suggest that, "language is the most clearly recognizable part of culture". When discuss about culture, religion is also an important element [4, 5]. Religion can be defined as "any set of attitudes, beliefs, and practices belonging to supernatural power" (Ember & Ember). From a psychological perspective, religious practices are seen as a reaction to anxieties, threats, unpredictable risks, and uncertainties that create and effect on individuals and their social groups [4].

Even though personality variables have been acknowledged as extremely related to cultural adjustment, there is inadequate empirical research observing their impact on this multifaceted adaptation process. There are two personality variables of special interest, which have constantly been recognized as influential on people's behaviors, are self-assurance/self-possession and self-efficacy. In order to be able to make a successful transition, self-efficacy mentions that how to meet needs of physical well-being, such as food and security, comes before self-efficacy in meeting school and work requirements. Thus, self-efficacy is essential to increase self-confidence for carry on in the new culture [6, 7].

Harrison, Chadwick, & Scales [8] suggest that individuals with high general self-efficacy apparent greater degrees of general, communication, and work adjustment, and this finding applies to any adjustment process including cultural transition. Moreover, individuals with high self-efficacy tend to insist in exposing new behaviors and, therefore, have better opportunities for receiving feedback about their developed skills than those with low self-efficacy. Therefore, self-efficacy may affect not only new students' perceptions about their abilities to perform successfully, at work and in universities, but also their skills at relating effectively [9]. Personal characteristics determine people's self-concept, which has an impact on the ways people interact with people in their environment. In the challenge to explain culture shock experiences and their symptoms, it is important to note cultural differences combined with personality structures. The following section we discuss more closely at the culture shock phenomenon. Conceptualized by Oberg [10] culture shock is defined as the significance of pressure and nervousness resulting from interaction with a new culture and the feelings of loss, mistake, and ineffectiveness, which are due to loss of habituated cultural cues and social rules. Bandura's [11] defines, which describes self-efficacy as an individual's belief about his/her capability to produce desired results [12]. Academic self-efficacy is the desire to method intellectually challenging situations without unwillingness or fear of not being able to handle them [7, 13]. Social self-efficacy is assurance in one's ability to involve in social interaction, which is essential not only to initiate but also to sustain interpersonal relationships in life [13, 14].

METHODOLOGY:

For making this report first we made a survey Questionnaire about current situation of international students, Cultural adoption, how students feel in here.so we design Questionnaire in several parts like family background, past experience, current situation, studying, living, future planning and also cultural adoption. After making Questionnaire first we did some pre-test like we were sent Questionnaire in E-mail to 5 of our senior brother and friends for their justification that is there's any problem or not. After their review and some suggestion we re-design this questionnaire. And we were shown it to our professor, our professor read all the question and had some changes and give us some suggestion about how to make it more convenient and how to collect more information from students, finally we design this Questionnaire.

Our study sample consisted of Wuhan Textile University international students from different country about their family background, past experience, current situation, studying, living, future planning and also cultural adoption. The sample was selected all the international students of Wuhan Textile University. The survey was conducted in an electronic format and also printed copy and sent via web link and hand to hand to all international students. About 104 students received the initial invitation as well as reminders to complete the survey during Two weeks in May, 2018.

DATA ANALYSIS:

This study highlighted the factors which may affect students believe and cultural adoption. The focus on all international students' evaluations was critical to address the self-centered implication of previous research related to international students. That research had focused on the adjustments of international students and mainly overlooked the role of local students' attitudes and behaviors in international students' socio-cultural combination. The present study highlighted the whole thing about international students. Based on our survey we find several things that we discuss in detail below:

About 93 students completed the survey, which represents a response rate of roughly 89.44 percent. Respondents were mostly male students 73.1 percent, with an average age of 24.4 years old. In terms of country, the largest group was from Bangladeshi student 58.1% then Pakistani students were 18.3% next from Uzbekistan, Egyptian and Russian students all are 5.4 %, and rest were from Kenya, India and Colombia. In terms of department, maximum numbers of respondents were from Textile department 31.2%, then dyeing and Fashion department 16.1%, about 10.8 % from Logistics department, Mechanical department had 8.6% and the rest are Accounting, CSC and software department. In below we detail discuss about our survey.

Basic Information:

To get better understand about international students phycology asked them about their some basic question which are as follows:

Q1. Please try to estimate the gross (after tax) ANNUAL income of your family household?

Q2. How many family members in your family?

Q3. How much your family offered to you each month for your living cost in china?

Table 1: Q1-Q3 regarding Income of Family/Family Members/Living Cost

Annual Income of Family	Family Members	Living Cost in China
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		Percent			Percent			Percent
Valid	< \$ 5000	59.1	Valid	3 Person	7.5	Valid	< 500 ¥	26.9
	\$5000 to \$10000	30.1		4 Person	17.2		500 ¥ to 700 ¥	30.1
	\$10000 to \$15000	8.6		5 Person	50.5		700 ¥ to 1000 ¥	29.0
	\$15000 to \$20000	2.2		6 Person	21.5		1000 ¥ to 1500 ¥	8.6
				7 Person	3.2		1500 ¥ 2000 ¥	5.4
Total		100	Total		100.0	Total		100.0

Here we examined that maximum number 59.8% of international student’s annual family income gross was around \$5000, 31.5% was \$5000 to \$10000, and rest are \$10000 to \$20000. A half percent of international students family member are five persons, 21.5% are six persons, 17.2% are four persons and rest are three and seven person. Last part of this table is very important part here we found that 30.1% international student’s spend 500¥ to 700¥ for their living cost in china, 29% were 700¥-1000¥, 26.9% were < 500 ¥ and other rest are 1000 ¥ to 20000 ¥.

Table 2: Q1-Q3 Correlations regarding Income of Family/Family Members/Living Cost

Correlations				
		ANNUAL Income of Family	Family Members	Living Cost in China
ANNUAL Income of Family	Pearson Correlation	1	.163	.430**
	Sig. (2-tailed)		.118	.000
	N	93	93	93
Family Members	Pearson Correlation	.163	1	.100
	Sig. (2-tailed)	.118		.341
	N	93	93	93
Living Cost in China	Pearson Correlation	.430**	.100	1
	Sig. (2-tailed)	.000	.341	
	N	93	93	93

** Correlation is significant at the 0.01 level (2-tailed).

According to this table we can say that living cost in China (how much one student expenses) has a medium correlation with the annual income of his/her family but with the number of family members have very small correlation with their expenses.

About Education and Environment of University:

- Q4. In your free time how many hours are you study in a week?
- Q5. Are you receiving a grant or scholarship?
- Q6. How satisfied are you with the level of contact with?
- Q7. Do you have enough playground and materials in campus premises?
- Q8. What you do in Study years (1st year, 2nd year) and Vacation?

In Q4 we found that around half of the international students studied 5 to 8 hours in a week, 21.5% were studied < 5 hours and only 18.3% studied 8 to 10 hours in a week. Question regarding scholarships 78.5% of international students were getting Chinese president scholarship and only 11.8% said that they were getting Chinese government scholarship. Almost 90% of international students are very satisfied and satisfied with their accommodation.

Table 3: Q6 Satisfaction Level of Contact

		Satisfied With International Department's Staffs	Satisfied With Department's Staffs	Satisfied With Teaching Staffs	Satisfied With Fellow Students	Satisfied With Working Staffs
		Percent	Percent	Percent	Percent	Percent
Valid	Very dissatisfied	1.1	1.1	1.1	1.1	1.1
	Dissatisfied	2.2	4.3	2.2	1.1	3.2
	Neither satisfied nor dissatisfied	8.6	14	14	16.1	16.1
	Satisfied	75.3	39.8	54.8	54.8	61.3
	Very Satisfied	12.9	40.9	28	26.9	18.3
	Total		100	100	100	100

In this Table we found that, 75.3% international students are satisfied and 12.9% completely satisfied with the level of contact with international department staff whereas only 2.2% are dissatisfied. 40.9%, 28%, 26.9% and 18.3% international students are completely satisfied and satisfied where only 4.3%, 2.2%, 1.1% and 3.2% are dissatisfied with the level of contact with their departmental staff, teaching staff, fellow students and working staff respectively. In terms of playground (Q7) 60.2% respondents

were very strongly agree with that WTU have enough play ground in the campus premises and 24.7% students are agreeing with it.

Table 4: Q8 Students Work in 1st year 2nd year and vacation

1st Year			2nd Year			Vacation		
		Percent			Percent			Percent
Valid	Study	92.5	Valid	Study	4.3	Valid	Study	8.6
	Part Time Jobs	1.1		Part Time Job	16.1		Part Time Job	3.2
	Full Time Jobs	4.3		Full Time Job	20.4		Full Time Job	6.5
	Do Research	2.2		Do Research	35.5		Stay at Campus For Relaxation	5.4
				Applied For PHD	23.7		Take a Trip	48.4
						Others	28.0	
	Total	100.0		Total	100.0		Total	100.0

In table 4 most of the students said, in 1st year of their academic year 92.5% of them do only study only 5.4% student do some work where 2.2% students start doing their research. The scenario is completely different in 2nd years because maximum number of student 35.5% work on their research, 23.7% were looking for PHD and 36.5% involved with full or part time jobs only 4.3% student keep their study on going.

In vacation, 48.4% respondents love to take a trip to explore China to get more idea regarding Chinese culture and only near about 10% students go for job and rest of them stay in campus for relaxation or study.

Relationships and Cultural Adaptation:

Q9. How you mark you relation with others?

Q10. Do you have Chinese & International Friends?

Q11. Do you have any good Chinese & international friends?

Q12. Do you ask for any help to any Chinese students before?

Q13. Are you ready to help others students?

Q14. Can you Speak Chinese or understand Chinese language?

Q15. Can you understand Chinese jokes?

Q16. What kind of activity you always do with your Chinese or international friends?

Q17. Do you like Chinese foods?

Q18. When you face injured or getting ill where do you go for help?

Table 5: Q9-Q11 Relationships with Multi-Culture Students

Relationships With Others			Good Chinese & International Friends			Help From Any Chinese Students		
		Percent			Percent			Percent
Valid	Very dissatisfied	1.1	Valid	Yes, I have both good Chinese & international friends	93.5	Valid	Yes, Always	28
	Dissatisfied	3.2		Yes, I have only some Chinese good friends	3.2		Yes, Sometimes	69.9
	Neither satisfied nor dissatisfied	10.8		Yes, I have only some International good friends	3.2		No, not at all	2.2
	Satisfied	45.2						
	Very Satisfied	38.7						
	Total	100	Total	100	Total	100	Total	100

The idea of "relationships" is wide and shifts from person to person. Individual relationships mention to close links between people, formed by emotional connections and collaborations. These bonds often grow from and are reinforced by mutual experiences. When we ask Q9, more than 80% students had satisfactory relationships with each other's only 4.3% students were dissatisfied with relations with others. In terms of good Chinese and International friends 93% replied they have good friendships with them and only 3.2% said they have only either Chinese or International friends only. About 69.9% international student's take help from Chinese students or other Chinese people and 28.5 respondents said they too help always and 2.2% respondents don't take any help from any Chinese.

Table 6: Q13-Q15 Relationships with Multi-Culture Students

Ready to Help Others Students			Speak Chinese language			Understand Chinese jokes		
		Percent			Percent			Percent
Valid	Yes, Always	41.9	Valid	Yes I can	2.2	Valid	Yes I Understand	2.1
	Yes, Sometimes	54.8		I can but little	96.8		Yes I Understand a little	83.9
	No, not at all	3.2		No, not at all	1.1		No, not at all	14.0

Total	100.0	Total	100.0	Total	100.0
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To build a good relationship helping each other is the best tool, regarding Q13 most of the students were ready to help each other. Almost our entire respondent said that they were understood or speak Chinese language a little Q14. We found that 83.9% international students said that they can understand Chinese jokes Q15 a little, 14% students said that they didn't understand Chinese jokes totally, here we think they are totally new students that's why they didn't understand it.

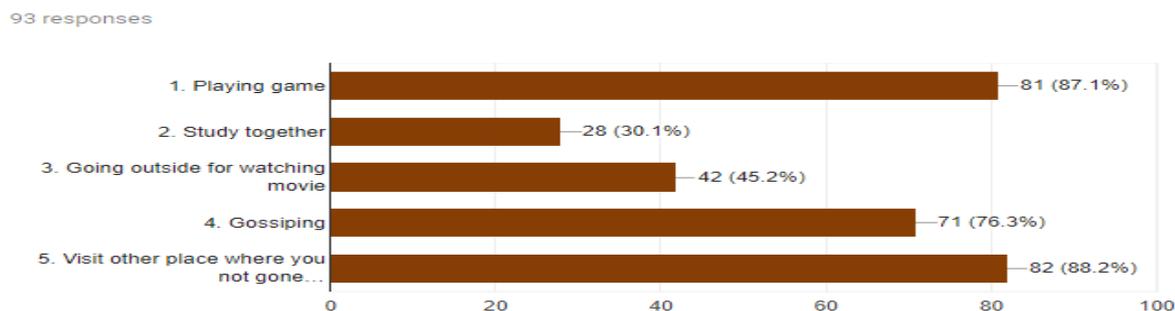


Figure 1: Q16 Activity with Chinese or international friends.

Q17, That was a multiple answer question respondents may lots of activates together, after getting this survey maximum number 88.2% visit new places with new friends, 87.1% play games, 76.3% do gossiping, 45.2% go outside to watch movies and 30.1% do their study together. In terms of Chinese foods about 89% respondents said they like Chinese food.

When they were face injured or getting ill they were going to school hospital. 20.4% said that when they face major injury or illness they were going to outside hospital for treatment and 17.2% said that maximum time when they face little illness they take some medicine which they were taken from their home country.

About University:

Q19. Are you happy with Wuhan Textile University?

Q20. Did you have job before coming here?

Q21. What is your Future Plan?

Table 6: Q13-Q15 Relationships with Multi-Culture Students

Happy With Wuhan Textile University?			Experience on the Labor Market			Future Plan		
		Percent			Percent			Percent
Valid	Dissatisfied	3.2	Valid	Yes, I had a regular paid job	65.6	Valid	Continue study (Like PHD) in China	39.8
	Neither satisfied nor dissatisfied	16.1		Yes, Casual minor job	4.3		Stay in China for job	22.6
	Satisfied	35.5		Yes, through vocational training	3.2		Back to my country	25.8
	Very Satisfied	45.2		No Experience	26.9		Move to some other country for study or job	11.8
Total		100.0	Total		100.0	Total		100.0

Out of 93 respondent 45.2% of international students were very much happy to being students of Wuhan Textile University. 35.5% students are happy and 16.1% are neither happy nor unhappy.

Before coming here maximum number of 66.3% respondents had regular paid job. 26.1% of them have no work experience before they are fresh and newly graduate students.

In terms of future plan, 39.8% international students said that they will continue their study in china like PHD, 25.8% said that they will move to their home country, 22.6% said that they will stay china for job and rest 11.8% said that they will try to move other countries for job or PHD.

PROBLEMS FINDINGS:

After the above analysis, the author has found the following questions:

First, the International students of WTU do not have enough Chinese vocabulary and reading. To understand mastery of word meaning, grammar, pragmatic environment, rhetoric and collocation Chinese vocabulary and readings are required. Moreover, Chinese strokes and pronunciation are so complicated so they feel lack of confidence in learning Chinese as well as treat as a burden on their Chinese learning.

Second, in daily communication and supportive works international students are less likely to use Chinese. Students can't adjust to link with local Chinese people. It shows that 75% of the international students are more willing to use their mother tongue to communicate with others and 25% of the students choose to communicate with others in English. Only 1% of the students will use Chinese to communicate. The main reason could be the lack of a good environment and opportunities to use Chinese to communicate. Furthermore, there are too few specific activities for them to apply Chinese knowledge and culture they learned from classes.

Third, International students understanding about Chinese culture and customs is primary stage, and further understanding should be made in many areas, mainly in the aspects of knowledge and understanding of Chinese traditional festivals and red tourist spots. Only 5% students know 6-9 red tourist attractions in Wuhan. Knowing slight knowledge about Chinese culture may due to little envelopment in Chinese culture in their learning and in the aspect of teaching methods, it may lack of gaudiness and in-depth description. Regarding Wuhan Textile University, it had not organized enough activities of Chinese culture or promoted sufficient opportunities and platforms to get to know Chinese traditional culture.

Fourth, in terms of evaluation of education, most of the student are satisfied with their department's staffs and teaching staffs. Whereas few students are not happy with the department as well as their teacher maybe it's because of their previous insinuate or cultural adaptation but it cannot be an excuse for the university.

RECOMMENDATIONS:

To solve the problems, the author gives the following suggestions:

First, international students don't have enough Chinese vocabulary and reading.

Suggestions: At first, set up special courses and lectures. Chinese vocabulary after thousands of years of development has a variation of forms, like polysemy, homonym and others. As for International students, their learning hitches in this area can be imaginary. Therefore, regarding these problems, the university should set up special vocabulary and reading courses and give academic lectures, teaching Chinese history and culture, simple lexical collocation and learning methods so that gradually expanding their interests in Chinese vocabulary and cognition of reading. Then, carry out plans of Chinese learning in each class. If International students lack an effective management, it will prominently decrease their Chinese learning accomplishments. According to this situation, each student should set up their own vocabulary and reading task weekly or monthly with teachers' direction. Having accomplished a stage of the plan, they will get prize which will stimulate their awareness in learning Chinese vocabulary and reading. Besides, Chinese teachers should also help the International students to review the grouping of words so as to enlarge students' vocabulary.

Second, International students are less likely to use Chinese to communicate in daily life and in interactive activities.

Suggestions: during the teaching development, teachers are fictional to inspire students to use Chinese to answer questions and deliberate in groups. For example, after studying a poem in class, the teacher can ask students to express their personal approaches by using Chinese. In the teaching design, there should be more games about Chinese and Chinese culture. For example, a game named Describe and Guess. The instruction of this game is that two students are in one group, one defines the picture which is about Chinese culture in Chinese and the other should predict what is in that picture so as to smart students to learn and speak Chinese happily. Teachers can arrange some local students whose Chinese and English are good and set up a voluntary organization to hold some exciting cooperative activities between foreign students and local students. During the activities, there is only Chinese can be used except for explaining the rules. These ways can be used to inspire students to use Chinese to communicate with local students.

Third, the knowledge of Chinese culture and customs for International students is preliminary. Suggestions: Firstly, authors believe Chinese culture should be considered and taught in more materials and arrangements to upgrade international students' understanding of Chinese traditional culture from many aspects and angles. For example, when celebrating the Dragon Boat Festival, Chinese teachers not only can tell the origin and the ways of celebration of the Dragon Boat Festival, but also can teach students to package traditional Chinese rice-pudding, which bring about an active atmosphere and improves students' interests in Chinese traditional culture and customs. In order to make students themselves understood the Spring Festival, Chinese teachers can hold a traditional arts party where some students perform on the stage while others sit around the desk to appreciate the performance with friends and get together to experience the cheerful, boisterous atmosphere of the Spring Festival. After the party, the teacher presents some couplets, teach some Chinese New Year blessings and then have an activity of role-playing called visiting relatives. For the sake of highlighting the biggest features of the Spring Festival, the teacher prepares some red envelopes with a four-word note before the class so that students feel more authentic atmosphere for the spring festival, which allows them to feel the happiness and sweetness of traditional Chinese festivals. Chinese teachers should create a light-hearted academic environment which is capable of promoting intensive comprehensible and interesting input, such as watching the famous Chinese movies, documentaries and drama to let students have a better understanding of the traditional culture. Then, Wuhan Textile University should organize students to visit the red tourist attractions around Wuhan. At last, the school should also conduct some traditional cultural activities and competitions, like ancient poetry contest, guess riddles games and costume play, whose activities and competitions aim to have a better understanding of Chinese culture.

Fourth, Wuhan Textile University should find the reason why students are not satisfied with their department and teachers and improve it as soon as possible.

CONCLUSIONS

With the increasing number of foreign students from different countries, the problem of cross-cultural adaptation is becoming more and more important and cross-cultural adaptation research has been given more and more attention. The research mainly analyzes the current situation of international students studying in Wuhan Textile University from the aspects of language learning and cultural customs and overall evaluation of WTU education performance. The problems mainly include lacking of Chinese reading and vocabulary, less communication in Chinese, difficulty in adapting to the teaching in China, less understanding of cultural customs and other issues.

So this study aims to help improve international student's cross-cultural adapting ability by establishing language self-confidence, developing Chinese communication activities, adjusting instructional design and increasing the content of courses of Chinese

culture in these four areas and for Wuhan Textile University to find out the dissatisfaction reason and find the best solution to improve it.

LIMITATIONS AND FUTURE RESEARCH

The current study gives insight into the experiences of international students in the China. Its findings are important for understanding international student adjustment issues, but the research needs to be replicated at other Chinese colleges and universities.

The international students participating in this study had been in China for an average of 2 to 4 years. This sample may, therefore, be reporting better adjustment than international students who have lived in the country for a shorter time.

A relatively large number of students attending the community college at which this study was done were not necessarily at what is considered college age. Age can have an impact on international student adjustment, self-confidence, and self-efficacy and may therefore have an influence on the results. In the future this study may be replicated considering the factors mentioned before to see if there are changes in the results. The current study has considered some of the many variables influencing adjustment issues of international students. The significant findings reported here provide important information for university and college personnel to reflect on their awareness of cultural and adaptation issues of international and may be valuable to their practices in dealing with this group of students.

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First Author – Rakibul Hasan Raki, Masters in Accounting, Wuhan Textile University and E-mail: roky.rakibulhasan37@gmail.com.

Second Author – Syed Shakil Ahmed, Masters in Logistics Engineering, Wuhan Textile University and E-mail: shakilwtu17@outlook.com.

Third Author – Md. Eusuf Amin, Masters in Accounting, Wuhan Textile University and E-mail: yousufamin208@gmail.com

Forth Author- Shafikul Islam, BBA, Southeast University and E-mail: shafikul8452@gmail.com

Correspondence Author – Syed Shakil Ahmed, email: shakilwtu17@outlook.com, alternate email: shakilwtu17@gmail.com, contact number: +8613036167680.

Analysis on Detecting of Leg Bone Fracture from X-ray Images

Wint War Myint¹, Hla Myo Tun², Khin Sandar Tun³

^{1,2,3}Department of Electronic Engineering, Yangon Technological University
Republic of the Union of Myanmar

mawintwahmyint.ytu@gmail.com, hmyotun@gmail.com, khinsandartun91@gmail.com

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Abstract — Computer Aided Diagnosis (CAD) combining engineering approach and medical approach is popular in medical works. Bone fracture detection system which is medical image processing is one important system in CAD field. The purpose of this work is that Lower Leg Bone (Tibia) in x-ray image is used to detect fracture or not by computer vision system. Bone fracture is a common problem which is mostly encountered in recent year. Using image processing tools, bone injury diagnosis is developed to be more accurate and reliable. Generally, fracture detection systems use image processing tools in matlab based on mathematical calculation. Automatic fracture detection system can effectively aid to doctors and radiologists to overcome heavy workload. The proposed system was implemented by preprocessing, feature extraction and classification. Sharpening is used for preprocessing, Harris corner detection is used for corner feature and SVM is used for classification. According to the result, the algorithm can correctly classify normal bone and broken bone with good accurate and quick rate with efficient features and single classifier.

Keywords: *Tibia, X-ray, Sharpening, Harris, SVM.*

INTRODUCTION

In recent year, Computer Aided Diagnosis becomes popular which can help the physicians and radiologists by computerized system. Sometimes doctors may encounter many patients with large of x-ray images so tired doctors can decide miss decisions. Moreover, manual inspection is tedious and time consuming. CAD systems are used to support the detection and characterization of disease. CAD can be applied to digital images for the purpose of addressing a variety of diagnostic problems. And then, many applications in medicine are using widely image processing techniques.

In many places, the problem of bone fracture mostly happens because of bone cancer, accident, osteoporosis, high pressure. Various types of bone fracture are compound, oblique, comminute, transverse, greenstick and spiral. To detect fracture, x-rays are most commonly used. Computerizing fracture detection in bone from x-ray images makes an orthopaedicians to work easy and also

Wint War Myint is with the Department of Electronic Engineering, Yangon Technological University, Gyogone, Insein, PO, 1011, Yangon, Myanmar (corresponding author to provide phone: 09960031700; e-mail: wintwahmyintytu@gmail.com).

Dr. Hla Myo Tun is now with the Department of Department of Electronic Engineering of Yangon Technology University, Gyogone,

Insein, PO,1011, Yangon, Myanmar(e-mail: hlamyotun.ytu@gmail.com).

Dr. Khin Sandar Tun is with the Department of Electronic Engineering of Yangon Technology University, Gyogone, Insein, PO, 1011, Yangon, Myanmar (e-mail: khinsandartun@gmail.com).

helps them in diagnosing the fractured system. Though the MRI and CT scans give the most reliable and high-quality. x-ray also give good quality images at a low price DICOM, the standard format for the storage of medical images which includes text [2]. X-ray machine take bone position by 53 kV and 4mAs using sensor plate. Using this plate, x-ray images can be printed.

Human body has 206 bones. The second largest bone is leg bone which is made up of two bones, the tibia and fibula. The tibia bone is larger and thicker than the fibula bone. Moreover, tibia fracture most commonly happens because it carries the significant portion of the body weight [1]. The central goal in this paper is detection of the lower leg bone (tibia bone) fracture from x-ray images. This paper is summarized as follow: section II presents Literature study of the related work. Section III explains the background theory and section IV discusses the methodologies of the proposed method. Section V discusses simulation results and discussion of the result. The last section is that conclusion of the result and future direction will be discussed.

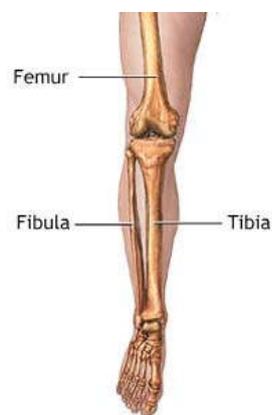


Figure 1. Lower Leg Bone of Human Body

RELATED WORKS

San Myint et al [1] present Leg Bone Fracture in x-ray image with preprocessing, segmentation, fracture detection and classification algorithm. In this work, feature extraction is carried out by Hough Transform technique to get line feature. Simulation result is that it can detect fracture or not in the image. It can be extent on small bone, ankle fractures. Fracture detection is carried out with classification approach. Visala DeepilaVegi et al [2] uses fracture detection system with preprocessing, segmentation and Hough Transform technique. There is no classification method .The author also describes comparing the detectors in segmentation. They are Sobel, Prewitt, Roberts and Canny. The author gives conclusion which is Sobel Edge detector is more efficient than the rest of the edge detectors for detecting Hough lines. The result helps the orthopaedicians to identity the fractured area of the bone in no time with transform approach. Future work is identification of type of fracture for radiologists. S.K.Mahendran, et al [3] describe tibia fracture detection with fusion classification techniques in x-ray images. This work is performed SACEN algorithm for preprocessing, wavelets and morphological and active contour based segmentation for segmentation. GLCM features are used for fusion classification. They observe that the results improve accuracy than single classifier. They describe future consideration is that other features like shape are to be considered for detection rate. They also publish ensemble system for fracture detection [4].In this work, results clearly indicates that combination classifiers shows high performance but time is considered single classifier works better. Mahmoud Al-Ayyoub, et al [5] apply various feature extraction methods, binary classification and 5-class classification .In the result, SVM classifier is the most accurate with 85%than 10-fold cross validation technique .But author emphasize classification, no detail explanation for feature extraction process.

BACKGROUND THEORY

Automatic bone fracture detection from x-ray images become popular as an important process in analysis of medical images for orthopaedicians and radiologists. Different types of medical images are X-ray, Magnetic Resonance Imaging (MRI), ultrasound, Computed Tomography (CT) etc. Among them, CT and X-ray are most frequently found in diagnosis of fracture. They are ease and fast for doctor to acquire the fractures of bone and joints[6].Automatic detection bone fracture system are most commonly done by preprocessing, segmentation, feature extraction (or) fracture detection and classification.

A. Preprocessing

Several medical images are noisy due to sensor and circuitry /digital camera so image data can degrade with respect to brightness value and geometry. Preprocessing step is to enhance the image in term of reducing noise and adjusting image intensity values. Resolution, brightness and contrast adjustment are included in preprocessing phase. The main goal of image enhancement is to remove noise, sharpen image edges and get soft focus (blurring) effect.

Image enhancement can be completed both in the spatial and in frequency domain. In spatial filtering can be

divided into liner filtering and non-linear filtering. Using of both linear and nonlinear filtering in image enhancement is for noise removal. Several noises are found in images. Typical noise are 'salt and pepper' and Gaussian noise [6]. There are number of different filters for removing this noise. They are:

- Mean filter or Averaging filter

The mean filter, liner filter replaces each pixel by average of all intensity values in local neighbourhood. The size of the neighbourhood controls the amount of filtering. Mean filtering may be used as a method for suppressing noise in an image. But, there are some limitations in mean filter.

- Median filter

Median filters are statistical non-linear filters often described in spatial domain. A median filter is smooth image by utilizing median of neighborhoods. Median filters perform with two steps. Firstly, all pixels in neighborhoods of the pixel in image which are identified by the mask are sorted in the ascending (or) descending order. Secondly, the median of sorted value is computed and is chosen as the pixel value for the process image.

- Gaussian filter

Gaussian filters are very significant not only theoretical but also practical reasons. Gaussian is type of linear smoothing filter according to weight chosen Gaussian function shape. The Gaussian kernel is broadly applied for smoothing resolution. 2-D Gaussian function can be stated by ;

$$f(x,y) = \frac{1}{2\pi\sigma^2} e^{-\frac{x^2+y^2}{2\sigma^2}} \quad (1)$$

where, σ is the width of Gaussian

Gaussian filter is separable. The Gaussian smoothing filters are very fine filters for removing noise drawn from a normal distribution. Gaussian functions have properties. Gaussian function are rotationally symmetric in two dimensions. The smoothening degree is controlled via variance σ . The larger σ indicates a wider Gaussian filter and greater smoothening.

Filtering is also used in edge detection. Derivative filter for discontinuities , First-order edge detection(Prewitt , Sobel and Roberts, edge detector filter kernels, linearly separable filtering),Second-order edge detection(Laplacian edge detection, Laplacian of Gaussian, Zero-crossing detector) are filtering method using respective kernels and operators for edge detection.

An edge enhancement method is frequently recognized as image sharpening

- Laplacian Edge Sharpening

Laplacian reacts to the well detail in the image but has a zero response to regions of constant and smooth gradient regions in the image. The original image is taken and added or subtracted by Laplacian

for enhancement good detail in the image imitatively.

$$I_{\text{output}}(x,y)=I_{\text{in}}(x,y)-\nabla^2 I_{\text{in}}(x,y) \quad (2)$$

where, ∇^2 is Laplacian operator.

• Unsharp Mask Filter

An another edge enhancement filter to Laplacian-based methods is the unsharp mask filter (boost filtering). Unsharp filtering works by subtracting a smoothed (or unsharp) form of an image from the original to emphasize or enhance the high-frequency component (edges) in the image. This operator creates an edge image from the original image by the following equation:

$$I_{\text{edge}}(c,r)=I_{\text{original}}(c,r)-I_{\text{smoothed}}(c,r) \quad (3)$$

The original is filtered with a mean or a Gaussian kernel. Image from resulting difference is added onto the original to result some sharpening degree.

$$I_{\text{enhanced}}(c,r)=I_{\text{original}}(c,r)+k(I_{\text{edges}}(c,r)) \quad (4)$$

where, k is scaling factor.

In this paper, Unsharp Masking Filter is used for enhancement and finding edge in image. So, edge detection step can be done in preprocessing stage.

B. Segmentation

Image Segmentation is the process of partitioning an image into group of pixels. Image segmentation can be broadly classified into two types: local segmentation and global segmentation. Image segmentation can be approached from three philosophical perspectives: Edge approach, Boundary approach, Region approach.

Edge detection is the process of finding meaningful transitions in an image. The points where sharp changes in the brightness. These points can be detected by computing intensity differences in local image. Edge-based segmentation is more suitable for bone fracture detection system [1]. In this paper, Canny edge detection method can be produced good view of the bone position. The Canny operator works in a multi-stage process. But, Sobel edge detection algorithm is more efficient in speed compared the Canny edge detection method [9]. Sobel edge operator is member of gradient method family and it used to find the absolute value of the gradient magnitude in the image [10]. Prewitt, Roberts, Log edge detection algorithm are also used in respective application. An enhanced active contour model using region growing algorithm to calculate initial seeds presented in [9]. K-means Clustering method is the simplest method in unsupervised classification. K-mean clustering is an iterative procedure. The K-means clustering algorithm clusters data by iteratively computing a mean intensity for each class and segmenting the image by classifying in the class with the closet mean. K-mean based algorithm is used in shaft segmentation by minimizing and objective function [11]. However, our work uses finding edge process by Unshripe Making algorithm, there is no need other segmentation process.

C. Feature Extraction (or) Fracture Detection

A feature is an image characteristic that can capture certain visual property of image. Feature Extraction is main step in various image processing. According to the favourable features, there are number of feature extraction techniques.

- GLCM (Gray Level Co-occurrence Matrix) is used for extraction of features. Texture images are complex visual patterns with color, brightness, size and shape. GLCM is a statistical technique to point out image texture. Image texture analysis is carried out by GLCM tool which extracts entropy, contrast, correlation, homogeneity. By calculating GLCM statistical value, bone fracture or non-fracture can decide [11]. For fracture detection, texture feature which is GLCM Mean, GLCM Variance, Energy, Entropy, Homogeneity, Gabor Orientation, Markov Random Field (MRF) and Intensity Gradient Direction (IGD) can be used[10].
- Hough transform is a feature extraction technique used in image analysis, computer vision, and digital image processing. It can identified straight lines, shapes, curves in image. The conventional Hough transform was emphatic by lines identification in the image. In commonly, a straight line $y = mx + b$ can be represented as a point (b, m) in the parameter space. For computational reasons using the Hesse normal form $r = x \cos \theta + y \sin \theta$, where r is the distance from the origin to the closest point on the straight line, θ (theta) is the angle between the x-axis and the line connecting with the original with the closet point. The points in the parameter space have numbers of lines in hough space according to different angles. The linear Hough transform method applied a two dimensional array, which assign an accumulator, to identify the existence of a line [12][13][14].

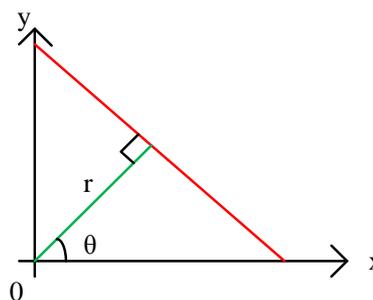


Figure 2. Hough Space for Straight Line

- Corner detection is a technique to extract certain kind of features. It is often used in image registration, video tracking and motion detection. A corner can be defined as the intersection of two edges. A corner can also be defined as the junction of two edges . An edge is a abruptly alternation in image brightness. It is characterized by the high variations of the intensity function $f(x,y)$ in both X and Y directions. Different corner detectors belong to Kanade-Lucas-Tomasi (KLT) operator and Harris operator which is simple, efficient and

reliable have been proposed by researchers for capturing the corners from the image[15].

In this work, Harris algorithm is carried out to extract corner points of fracture structure in images.

D. Classification

Classification is a phase of information analysis to learn a set of data and categorize them into a number of categories. Classification takes a feature vector as an input and responds category to which the object belongs [5]. Classification can be divided into supervised classification and unsupervised classification. Image classification includes two main processing tasks: training and testing. In training task, characteristic properties of typical image features are isolated. In testing task, these feature-space partitions are used to classify image feature[16]. There are various type of classifiers for solving training and testing phases. Among them, some popular classifiers are;

- Decision tree classifier is a hierarchically based classifier which compares the data with a range of properly selected features. Each decision tree or set of rules should be designed by an expert. It is also called a binary decision tree classifier.
- ANN (Artificial Neural Network), a brain-style computational model has been used for much application. According the research needed, various ANN's structure can be designed. After the network is trained, it can be used for image classification.
- Support Vector Machine (SVM) is popular method in pattern classification image classification. SVM builds the optimal separating hyperplanes depended on a kernel function (K). Feature vectors of images lies on one side of hyper plane. Class1 is one side of the hyper plane and other side is class2.

IMPLEMENTATION

In this paper, tibia a fracture detection system is implemented by three steps. They are preprocessing, feature extraction and classification.

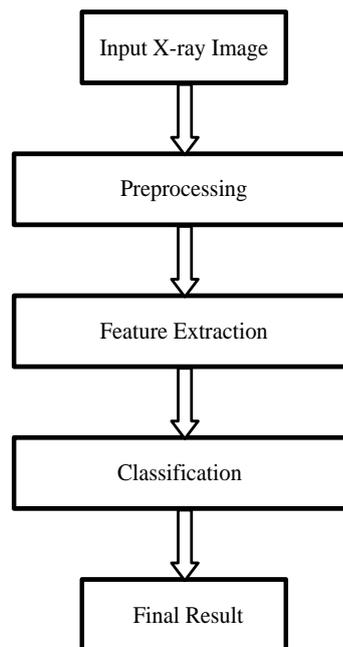


Figure 3. Block Diagram of The System

A. Preprocessing

In this study, preprocessing phase is done by Unsharp Mask Filter. It is image sharpening technique. This technique uses a blurred, or "unsharp", negative image which is a mask of the original image. Unsharp mask, less blurry than the original is then combined with the positive (original) image. USM can increase either sharpness or (local) contrast because of differences values between original image and blur image. By using the mask, edge enhancement image can be created.



Figure 4. Output images of sharpening

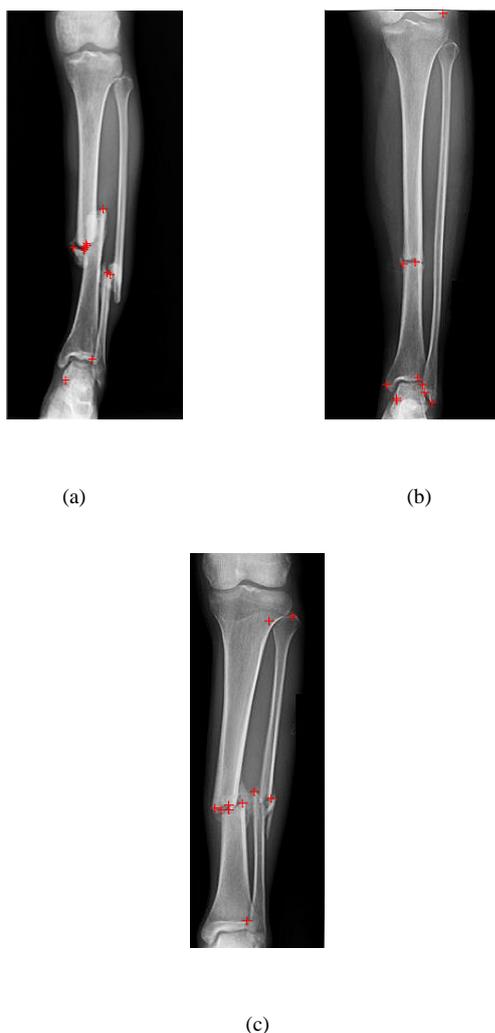


Figure 5. Results of Harris Corner Detection

B. Feature Extraction

In our work, Harris algorithm is used to find the edge points as features. Harris corner detection algorithm can analyse liner edge, flat and corner belong to X-derivative and Y-derivative. It finds energy (gradient values) to get two eigenvalues which can decide edge, flat and corner. If two eigenvalues are small, the result is flat region. If two eigenvalues are large, the result is edge. If one eigenvalue is larger than other value, it is a corner. The mathematical calculation of energy equation is

$$E = \sum w(x,y) [I(x+u,y+v) - I(x,y)]^2 \quad (5)$$

E is the difference between the original and the moved window. u is the window's displacement in the x direction. v is the window's displacement in the y direction. (x, y) is the window at position (x, y) which acts like a mask. I is the intensity of the image at a position (x, y). I(x+u, y+v) is the intensity of the moved window. I(x, y) is the intensity of the original. I_x and I_y is gradient components for x-axis and y-axis. Its derivatives form is

$$E(u, v) \approx \sum [I(x, y) + uI_x + vI_y - I(x, y)]^2 \quad (6)$$

Expand square and I(x, y) cancels out,

$$E(x, y) \approx \sum u^2 I_x^2 + 2uvI_x I_y + v^2 I_y^2 \quad (7)$$

Matrix form is

$$E(u, v) \approx [u \ v] \left(\sum \begin{bmatrix} I_x^2 & I_x I_y \\ I_x I_y & I_y^2 \end{bmatrix} \right) \begin{bmatrix} u \\ v \end{bmatrix} \quad (8)$$

Rename the summed-matrix,

$$M = \sum_{(x,y)} w(x, y) \begin{bmatrix} I_x^2 & I_x I_y \\ I_x I_y & I_y^2 \end{bmatrix} \quad (9)$$

$$E(u, v) \approx [u \ v] M \begin{bmatrix} u \\ v \end{bmatrix} \quad (10)$$

where, M is 2x2 matrix from image derivative. Eigenvalues (λ_1, λ_2) of the matrix can help determine the suitability of a window. R, is calculated for each window.

$$R = \det M - k(\text{trace } M)^2 \quad (11)$$

$$\text{Det } M = \lambda_1 \lambda_2 \quad (12)$$

$$\text{trace } M = \lambda_1 + \lambda_2 \quad (13)$$

The results of feature extraction are shown in figure(5).

C. Classification

In this paper, SVM classifier is conducted for classification phase. It is supervised learning models. It performs binary classification for this work. A Support Vector Machine (SVM) is a discriminative classifier formally defined by a separating hyperplane. In two dimensional space, this hyperplane is a line dividing a plane in two parts where in each class lay in either side. Firstly, support vector are calculated for setting hyperplane. Efficient feature vectors help to get good hyperplane for deciding the classification. Input image is firstly trained into a training image feature set. It built an optimal hyperplane according to the support vectors which are one side of hyperplane [17].

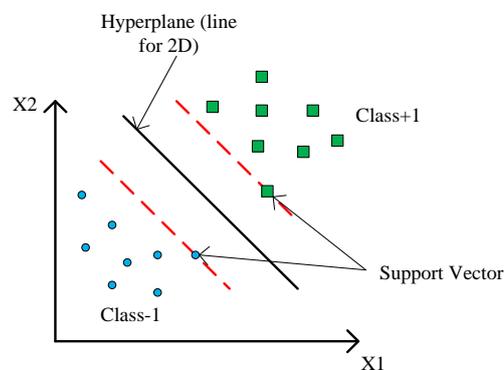


Figure 6. Overview of SVM Classification

In this paper, input image is extracted as corner or break points by harris. This point features are input for SVM. Firstly, SVM is trained by number of break point and classes that is break point number is zero is defined as class-1(normal bone) and number of break points is more

than zero is classified as class+1(broken bone). And then, tested images go to class -1 and class+1 according to the detected feature corner or break points.

Moreover, SVM produces the answer as normal belong to class-1.

SIMULATION RESULTS

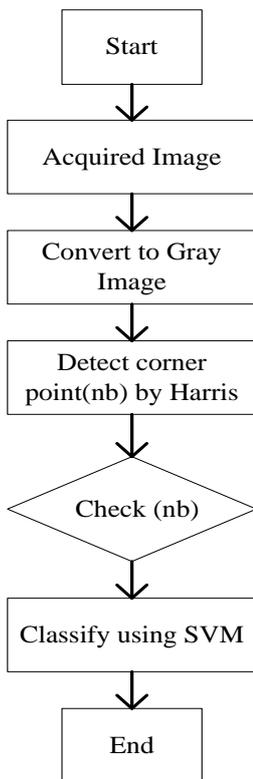


Figure 7. Flow Diagram of the System

This paper is detection of tibia bone fracture in x-ray image combining Harris and SVM. Image sharpening is very effective for noise removal and edge finding because it makes blur image with liner or non-linear filtering and subtracts it from original image to get the edge. So, in this step, edges can also find so segmentation step is not required. In feature extraction phase, Harris corner algorithm produces every edge and corner points by choosing sensitivity factor (0.2) and quality level (0.1). In bone image, if there is a fracture, there may be edge or corner. To get the useful corner, there is setting maximum 10 corner points and threshold values (0.3 and 0.8 for normalization). SVM trains the fracture as class+1 and non-fracture as class-1. After that all, the system can detect broken bone as class+1 and normal bone as class-1 in the results.

In figure (8), there is bone broken in middle region, Harris detects eight corner points and SVM classifies as class +1 bone broken. Although there is many corner points in image, harris works in important points. Similarly, in figure (9), it is fracture bone. There is 2 corners by Harris algorithm and SVM results class+1. At least one corner is detected the system can output the fracture answer. According to figure (8) and figure (9), the algorithm knows not only worst the break but also simple of break. According to figure(10),as diaphysis(middle) region is not broken, there is no detected corner point.

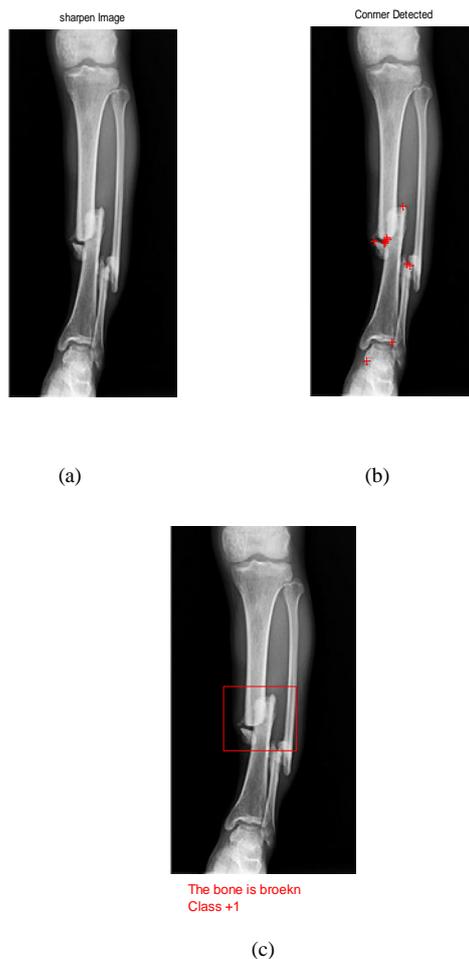


Figure 8. Result of Bone Fracture

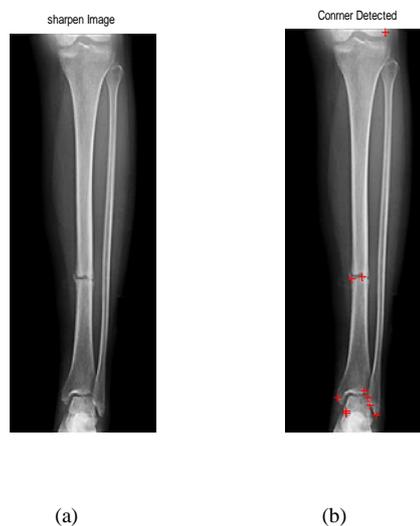




Figure 9. Result of Bone Fracture

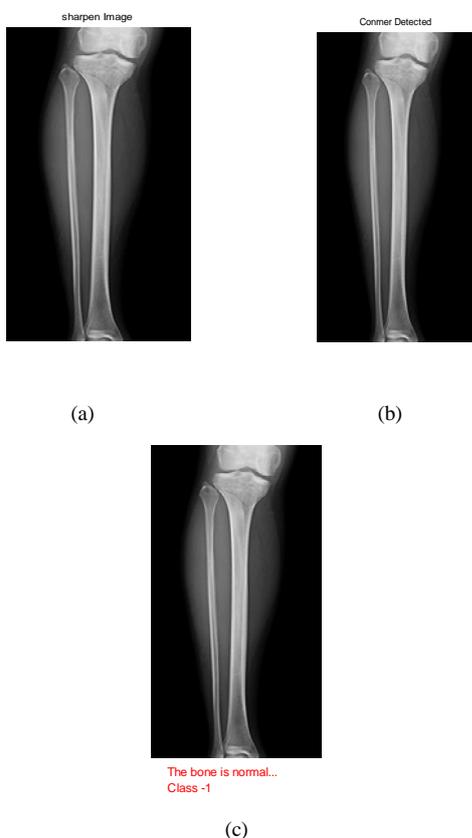


Figure 10. Result of Non-Fracture

CONCLUSION

This paper presented the detection of leg bone fracture analysis in X-ray images using image processing tool. X-ray images are collected from Yangon orthopaedic hospital. In this paper, 25 x-ray images are tested. Among them, 10 images are normal image and 16 are fracture images. This system cannot correctly detect 2 fracture images. So, Harris detects fracture correctly with 92%.

In this work, time can save because segmentation step is reduced. Although some other researchers use edge detectors in segmentation stage, edge finding is done in sharpening process in preprocessing in this work. In other paper, bone fracture detection is conducted by hough transform method but classification method is used for this work. So, processing time and classification accuracy is

more efficient. This system can produce the result during approximately 0.98 second. The system is designed to operate with around 200x400 image size. If the form of bone fracture is vertical line which is not corner algorithm cannot correctly answer the fracture. In future, it can focus on another portions like ulna, radius fibula and problem of type classification.

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Immodesty and Prejudice in Women Language Use: A Critical Discourse Analysis

Nwaugo Goodseed Ochulor

Babcock University, Ogun State

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Abstract- This study examines women- versus-women language use to underscore the fact that women languages are never neutral but embody ideologies and power relations. Literature is filled with men versus women discourses with more of stereotypical conclusions about women language use, leading to voicelessness in respect of women versus women subjugation. Using the tool of Critical Discourse Analysis, this study examined some excerpts from a Nigerian film titled *A Little Lie* to underscore some systems of bias and subjugation in some women's language against their sisters. The analysis of the women language use showed evidences of superiority/inferiority and domination of some women by other women as a result of childlessness. The study recommends that the identity of a woman among her peers should not be determined by whether she has a child or not. In addition, an intentional effort be made to throw in voices into this voiceless area by feminists' proponents, in order to liberate some of these women who are treated as less than a human by other women.

Index Terms- language, critical discourse analysis, power, ideology, feminism, African women.

I. INTRODUCTION

Language is a multidimensional tool that can be wielded in diverse directions to attend diverse goals. These goals are never abstract but concrete as they constitute the structures identifiable in any society. The study of language in the diverse directions is bound to elucidate various concrete activities of man. This has been evidenced in the study of language use in politics, social relations, economy, religion, even in history and more. It is the study of language that gave birth to the two warring ideologies of gender (patriarchy/ chauvinism and feminism) in literature.

Feminism is a system of beliefs and theories that call for a special attention to women's rights and positions in cultures and societies that marginalize women. It is a movement that advocates the women's right and position in politics, religion, public life, economy, job situations and legal status. Feminists' ideologies were tools to redress the positions and rights of the women in societies where women were seen as unequal to men, an aberration, objects of men's fad, property and even of the same status with animals. Such societies were structured in such a way to benefit men to the detriment of women. These chauvinistic ideologies led to the agitation against female suffrage, the condemnation of the society's attitude towards the

aged, treatment of women as inferior, a vindication of the rights of women, a call for attention to the full participation of women in the rights and duties of citizens, women's right to education, politics, marriage and child bearing, child custody, property and more. Further agitations of the feminists include the need for freedom from violence- domestic, social and family, and freedom from structural oppression due to social and political systems fueled by the patriarchal ideologies.

The Beijing conference held in China in 1995 was occupied with the concern that the concept of feminism is a call to sisterhood. A call to stand up for the oppressed woman and to stand down any culture, attitude, belief, or even a society that oppresses, subjugates and dominates women. To that effect, feminism has been addressed from different angles by different feminists.

The impact of feminism has thriven in drawing public attention to the different levels of inequality between men and women as well as to the structures within many societies that belittle and work against women's rights and development. This has resulted in a reconstruction and reconsideration of women's roles, interests and concerns in many cultures and societies. But unfortunately, the feminists or the women themselves, have not made enough concerted effort towards addressing the prejudiced roles many women play against their sisters. These roles might or might not be overt. Few feminist writers have touched this concern partially in their literary works, but the right kind of attention has not been given to this plight by feminist writers. In the area of language use amongst the sister-hood, no serious attention has been paid to understand how women dehumanise, dominate, deny, and even subordinate other women with their language use.

The concern of this study is to explore the ways women language use reveals domination, dehumanization and superiority over others. In other words we are going to explore areas of women activities that are anti-sisterhood, anti-woman development, anti-women rights and anti-women equality. In addition, this study is a call to break the yoke of silence that has kept many women out of the objective realities of the true quest of feminism within the African context. African women writers have used their literatures to address the issues of self-expression, self- definition, self-discovery and as a liberating force towards African woman's self actualization but it seems as if the African woman is very busy outside, that she tends to forget the inside. As noted by Kolawole (1997:6), African women have emerged from silence transcending the many limiting borders imposed on them by patriarchal traditional or

post colonial structures and have taken positions as the mouth pieces for their gender even from various polar ideological stances. She goes further to say that the result of this has made the African woman visible and conscious through the activities of women activists.

II. LITERATURE REVIEW

Few female voices have identified that women are the problem of their fellow women. This is mostly addressed in literary terms but there seem not to be any serious attention or effort made to see how this is perpetuated in their language use. In other words, women-versus-women discourses have either been taken to be abstract or of less importance in the society. This, the study is out to negate and just as the Whorfian Hypothesis (1956) asserts, “We dissect nature along lines laid by our own language... the world is presented as a kaleidoscope flux of impressions which has to be organized by our minds—and this means largely, by the linguistic systems in our minds.” Women language cannot be taken to be abstract or of less importance since we use language to represent the complexity of the world the way we perceive it in our minds.

Jørgensen and Phillips (2002) posit that:

language is not merely a channel through which information about underlying mental states and behaviour or facts about the world are communicated. On the contrary, language is a ‘machine’ that generates, and as a result constitutes, the social world. This also extends to the constitution of social identities and social relations.

Critical discourse analysis (CDA) is a type of research which attempts to reveal the connections between language use, power and ideology. CDA enables one to understand issues regarding power and control as well as the role language plays in these issues.

According to Van Lier (2004), language awareness develops through social interaction. He asserts that focusing on certain linguistic elements in the environment is required to raise critical language awareness. Discourse is one important activity of man which is both semiotic and social. It is an instrument of social construction of reality as perceived by the discourse participants i.e., language use shows language user’s perception of a society or an individual. This, then means that the meaning of the linguistic elements in participants’ discourses have a dialectical relationship with social identities, social relationships and systems of knowledge and belief of the objects of a talk. According to Foucault (2002: p.54), discourses are “practices that systematically form the objects of which they speak”. This is because texts are the only evidence for the existence of discourses; one kind of concrete realisation of abstract forms of knowledge; which interacts and is influenced by sociolinguistic factors. These discourses manifest ideologies that find themselves into people’s consciousness, and influence their actions. Ideology, according to Hodge and Kress (1993), involves a systematically organized presentation of reality. In other words, the use of different euphemistic or derogatory terms leads to different presentations of realities and therefore, ideologies.

Celce-Murcia and Olshtain (2000) assert that the primary interest of critical discourse analysis is to deconstruct and expose evidences of social inequality as expressed, constituted and legitimised through language use. Critical Discourse Analysis (CDA) has been described as “a type of discourse analytic research that studies the way social power abuse, dominance and inequality are enacted, reproduced, and resisted by text and talk in the social and political context,” Van Dijk (200).

In other words, the critical analysis of the women language will challenge us to move from seeing women language as abstract, to seeing such words as having meanings in the contexts where they are used. Robin Lakoff (1975) agrees with the notion when he states that, “Our use of language embodies attitudes as well as referential meanings”. Women saw men’s language as foundational to the attitudes that are marginal to life and concerns of women. Fiske (1994) posits that “our words are never neutral”. In this respect, our words (written or oral) are used to convey a broad sense of meanings and the meanings we convey with those words are identified by our immediate social, political, and historical conditions.

Language is a tool for expressing oneself using words. It serves as a way of knowing, valuing, and experiencing the world. Gracia (2004) asserts that language does things and that it is the creator of realities, and its results can be made explicit and analyzed in the light of the scientific knowledge produced by human/social sciences. Luke, (1997) puts it that critical analysis of language is necessary for describing, interpreting, analysing, and critiquing social life reflected in text. CDA has been able to reveal through studies that written texts and spoken words reveal discursive sources of power, dominance, inequality, and bias and how these sources are initiated, maintained, reproduced, and transformed within specific social, economic, political, and historical contexts (Van Dijk, 1988). As a matter of fact, language use in a discourse is a subtle way of recreating reality and a way of favouring the interests of some people against others. The emergence of critical discourse analysis helps to explain the complexity and articulation of the discursive phenomena that produce discourses. Hence, discourse is the creator of practices, just as practices can comprise different discourses. Discourses play different roles in human lives and in human societies.

Emenyi (2005: 127) also asserts that literacy has empowered women to explore new possibilities that focus on the realities of womanhood that were hitherto ignored by men. She stresses that the common agenda of women writers and critics and other women activists is tied towards an assertion of equality and awareness of sisterhood, the communality of women.

Feminism as a social movement sought to redress the imbalances in the society by providing women with same rights and opportunities as men, so that they will be able to take their rightful place in the world. After the feminist re-awakening in the 1970s, feminists began to realize that equal rights alone cannot free women from sexual and social subordination. Intellectual starvation, economic expression, commercial exploitation, domestic domination, physical abuse, sexual harassment and lack of personal freedom continued to affect the lives of women in spite of laws to the contrary. Hence, Western feminist writers and critics were forced to re-analyze and re-access the socio-cultural setups, looking for clues to explain the mechanism of patriarchy

that contrived to keep women eternally subjugated. (Emenyi (2005). They came to the realization that the notion of difference, whatever its value conceptually, rarely projects social equality or justice or mutual respect. In contexts where difference exists in language use among women, these differences can stratify the women on unequal terms.

The situations of chauvinism portrayed in literatures have always been addressed to the man in the society. But within these contexts, certain utterances and attitudes by some female characters in some works of literature are clear cut evidences to the fact that the female is not free from chauvinism in her treatment of her fellow woman. Etego (2013) projects what she observes from many African societies thus, “women seem to be deceptive in the sense that within its borders, there exist status, class, race, ethnicity, deprivation and subjugation.” There should be a fight against the activities. The “well-to-do” must realize their responsibilities and their limitations and learn to respect other women’s rights, dignity and personality.

Kolawole (1997: p.21) projects the African women writers and feminists as having been crying out against all forms of oppression against women. She goes further to cite Alice walker’s definition of feminism thus:

“feminism is the political theory that struggles to free all women: women of color, working-class women, poor women, disabled women, lesbians, old women-as well as white economically privileged, heterosexual woman. Anything less than this vision of total freedom is not feminism but merely female self-aggrandizement.

From the above, it becomes obvious that any aspect of the feminists activities that reveals power-imbalance, oppression, dominance, prejudice, denial etc, must not be glossed over. The lens of the African feminists should be redirected towards the plight of the poor, helpless women especially the housemaids, their madams, the daughters-in law and mothers in-law whose dehumanizing activities have been so prevalent as shown in African movies, on newspaper pages and in the lyric of songs sung by these women against their fellow women, which have remained mute or voiceless.

It is this call to awaken the consciousness of the African women to the plight of her sister in the hands of other sisters- as there exist different worlds within the female worlds- that this work sets out to do. If the African women have been mobilized to fight for their rights and that of other woman from the hand of men, why have they not realized that some women’s rights are being denied them by other women.

The attitude of men towards women who are attributed to be infertile has been of great concern in the struggle between chauvinists and feminists. Flora Nwapa’s *One is Enough* experience portrays the condition of the African woman who has no child. In the intersection of male and female gendered voices by Emenyi (2005), she cites Helen Chukwu who posits that “fertility is a continental flag and childlessness a curse. In the same *One is Enough*, Nwapa’s mother in law sees her as useless (Emenyi 105). The one that has no child is supposedly an inferior (woman) human being or even not deserving life.

Does a woman manufacture children? Can she be a complete woman without children? Has she a right to decide not to have children? And does such decision make her less than a woman or a human being? If a woman is a woman, a human being with equal right to life as any other woman, whether married or unmarried, with child or childless, then there should be revolutionary and reactionary feminists, towards the rejection of those perimeters of oppression found in the female dominant cultures. The lens used for analysis of patriarchal oppression and the emphasis that led to the social changes in patriarchy must be redirected homewards or inwards towards these challenges amongst women.

Obioma (1997) in a paper titled: “The Politics of Mothering” observes that it is a fact that in many African societies, women act as oppressive agents to other woman especially as co-workers, mothers-in-law, daughters-in-law, older women and step mothers. Onwueme (1992) *Go Tell it to Women* laments the disunity among women where women no longer fight for equality but for extermination of even a fellow woman. The analysis of the data will give more insight to these concerns.

III. FRAMEWORK

CDA provides some approaches to research with the primary aim of uncovering the relationship between language, society, power, ideology, values and opinions. The study adopts Fairclough’s (2003) theoretical-methodological device of critical discourse analysis. This model approaches discourse from three-dimensions. In the first dimension of the model, discourse is analyzed as text by identification and description of the linguistic features. at the second level, discourse is examined from a broader sense of the context of the identified linguistic features; in other words, a link is made between the wider social context of the discourse participants and the situation or condition in which the talk/text is expressed. The third level projects discourse as a social practice or reality. All these dimensions are dialectically related, and are part of the analytic dynamics of the discursive materials. Phillips & Hardy (2002) are of the opinion that social reality is constructed and made real through discourses, and social interactions cannot be understood without reference to discourses that give them meaning. In the same manner, Van Dijk, (1997) asserts that if we aim to understand discourses, we must understand the contexts in which they appear. Seeing discourse as social practice enables us to combine the perspectives of structure and action, so as to determine the position of the women in the network of activities within the film. In other words, the excerpts will help to reveal live performances, social actions and patterns of interaction that dominate women discourses. In this study, the analysis will be geared towards revealing the disparity among women as accomplished or imply through their discourses from the film.

IV. DATA PRESENTATION /ANALYSIS

The excerpts below are got from an exchange between a daughter-in law and a mother-in law. The discourse ensured as the mother-in law arrived from the village to the house of the daughter-in law.

Mother-in law: Give me a baby, am not asking for babies.

Daughter- in law: Please mama calm down you are just arriving from the village.

Mother-in law: Should I calm down? Do you know what my fellow women are doing to me with their months? ... I have waited enough or don't I deserve to carry my grandchild? I have run out of patience.

If I die without carrying my grandchild because of your wickedness, my blood will be on your head. Ogechi talk to me, tell me if you are taking anything to prevent pregnancy or you don't want baby to suck your breast?

As the son came back from work and the daughter-in law came out to greet the husband, she greets the son with the question;

Mother-in law: "What is this one doing in your house?"

(the second day of her visit)

Daughter-in law: Mama I am going to the market. Do you need anything?

Mother-in law: Do I need anything? You cannot buy my need from the market; in fact I will follow you to show you what I need.

Mother-in law: *(As they were driving to the market, she jump out of the car to carry a baby on another woman's back, plays with the baby and tells the mother of the child "My daughter in-law has refused to give her a grandchild."*

(she carries the baby to the daughter-in law)

Mother-in law: this is what I need.

Daughter-in law: *(She cries and runs to a church to cry her life out to her God).*

Mother-in law: -let her cry and confess her sins. Who knows the number of abortions she committed and the number of children she killed. Let her confess that God may forgive here and give her children

(At The Table)

Mother-in law: Did you look at the dinning table, does it look complete? You are supposed to have father, mother and children so that your table will be full and your food will be sweeter. Why are we eating? Are you not supposed to share food with your children?

Daughter-in law: My mother in-law please leave me alone. What did I do to you? Am I the one to give myself a child? It is not God that gives children?

(In The Kitchen)

Mother-in law: What are you cooking? Is that what you came to this house to do? Cooking for who? You should be starving in this house until you have given me a baby. Get out of the kitchen.

Daughter-in law: *(weeping in the bedroom reports to the husband).*

She practically sacked me from my kitchen, put out the fire and throw down my pot.

(At this point, the son insists that she must leave his house and as she was going, she remarks)

Mother-in law: What should I be doing in a house like this, where there is no grandchild? Ogechi, I am going to the village. I will take your name to them that you refused to continue their lineage. I don't blame you, it is my son that went

to marry a man like himself. The blood of their family will be on your head.

Give me a child but if you can not, you are useless

These mothers-in laws arrive their daughters-in law places without the simple courtesy of the social interaction that requires greetings versus greetings but plunges into an attack on their childless situations which is a face threatening act or negative face. This shows a bridge of the acceptable social relations between persons who are just coming together, which is based on the fact that they are childless. Their childless situation denies them their social respect which is as a result of the women's social perception of these daughters- in law, which in essence, necessitated the labels they framed for them. From these excerpts, it is a common belief that a childless woman has something to do with her childlessness. Inferred from the utterances above are some systems of beliefs that women hold against the childless woman.

V. SUPERIORITY/ POWER/POWERLESSNESS

From the excerpts above, it is obvious that motherhood is an ideology of superiority by which a woman can dominate, derogate and subordinate another woman. Having a child makes a woman powerful while the childless woman is made powerless. Looking at the exchanges from the two, the utterance, "Do you know what my fellow women are doing to me with their months?" goes further to establish the fact that a woman who has no grandchild from her son who is married, makes her powerless (an object of mockery) in the presence of her fellow women who have grand children. In other words, a woman with a grand child has power over another who has none.

Ogechi's childlessness gave the mother-in law the power to act and use words derogatorily at her. The question she asked the son: "what is this one doing in your house?", is evident of the fact that the mother-in law does not see her daughter-in law as having a space she can call her own in that house because she has not child. The use of "this one" instead of her name shows the level of humiliation since lack of name calling shows less or non-existence.

VI. SYSTEMS OF SUBJUGATION

A childless woman is termed wicked especially when she is unable to bear children before the death of the mother-in law. Her act of wickedness is buttressed further in the following expressions: "taking something to prevent pregnancy, having killed all her children through abortion (this goes specially to an educated woman), refusing to give a grandchild, deceiving a man to marry her, not knowing that she is a man, and being intentional in stopping or destroying the man's lineage which renders her useless. These constitute ideological stances which are ingredients of women language use against the childless woman.

Childless situation puts on the barren woman the responsibility of the blood of her mother-in law as well as the blood of the husband's lineage, especially where the husband is

the only son. The inability of a woman to give birth invariably brings a curse on her, thus:

“If I die without carrying my grandchild because of your wickedness, my blood will be on your head. ... tell me if you are taking anything to prevent pregnancy or you don't want baby to suck your breast?”

The “them” that the mother-in law will take her name to, are the in-group/ superior/ fruitful women in the village who will wait for her to attack her at the death of her mother-in law, to show her what it takes to be wicked as they perceive it. In my area, it used to be a bitter experience for the childless woman whose mother-in law reported to “them” that her daughter-in law is wicked and does not want her to carry her grandchildren. At the eve of the burial of such a mother-in law- one that died without carrying her grandchildren, the women will normally gather at a corner in the compound and invite the lady over for a talk in pretense. They will form a circle and ask her to enter the middle of the circle. At that, point they will remind her that the mother-in law died with a heavy heart because she did not allow her to carry her grandchildren. Whether she agrees or not, they will pull her in and give her some beatings as a reward for her wickedness. In some other situations, they may ask the young people to gather some black ants during the day and put them in a container and bring to them; which they will do innocently. As the daughter-in law enters the circle, whether at will or by force, they will pour out those black ants on the ground and force her to sit on them so they can sting her. The ants' sting in this case becomes a reward for her wickedness. The mildest treatment will be to barn her from seeing the corps of the mother-in law or from coming near her casket during the burial ceremony.

Implied by word “prevent” and the phrase “don't want” are expressions that embody another belief of some class of women that the beauty of a woman resides in the fact of her standing breasts as against the one whose breasts has fallen. In other words, some women don't want to get pregnant in order not to lose their beauty while others resign from breastfeeding their children so that their breast will not fall flat, thereby making them lose their beauty. This ideology has translated into a business idea in the world today whereby padded brassiere and padded clothes are used as alternatives to keep the woman's appearance more attractive.

Let her cry and **confess** her sins. Who knows the number of **abortions** she committed and the number of **children** she **killed**.

Revealed in the utterance above is another dimension of the beliefs that women hold against the childless woman. A childless woman is termed wicked especially when she is unable to bear children before the death of the mother-in law. Her act of wickedness is buttressed further in “taking something to prevent pregnancy, having killed all her children through abortion, which has turned her into a man, i.e. one that can never get pregnant which also buttresses the fact of her being intentional in stopping the man's lineage which renders her useless.

Thus, the expressions: wicked, prevent pregnancy, refuse to give birth, killed or aborted children, a man, stopping lineage

and useless, are ideological stances which are found among women language use against the childless woman.

VII. DEHUMANIZATION/HUMILIATION

Dehumanization has to do with violent attack on an individual whether physically, socially, psychologically/ mentally, domestically or by verbal assault. This is accomplished through the use of the declarative and interrogative sentences thus:

“Give me a baby, am not asking for babies”

“What is this one doing in your house?”

“You cannot buy my need from the market, in fact I will follow you to show you what I need.”

“This is what I need.”

“I don't blame you, it is my son that went to marry a man like himself.”

“The blood of their family will be on your head.”

“Did you look at the dinning table, does it look complete?”

You are supposed to have father, mother and children so that your table will be full and your food will be sweeter.

Why are we eating? Are you not supposed to share food with your children?”

“What are you cooking? Is that what you came to this house to do? Cooking for who? You should be starving in this house until you have given me a baby.

Get out of the kitchen.”

“Give me a child but if you can not, you are useless”

In addition, her childless situation has put on her the responsibility of the blood of her mother-in law as well as the blood of the husband's lineage, since the husband is the only son. Her inability to give birth has invariably brought a curse on her. The “them” that the mother-in law will take her name to, are other women in the village who will wait for her at the death of her mother-in law to show her what it takes to be wicked.

Verbally, she was assaulted with derogatory evaluative adjectives: wicked, useless, and the actional verbs: killed, aborted etc.

VIII. CONCLUSION

This film, *A Little Lie*, is a remarkable masterpiece that projects the misery of an infertile woman in the hand of a fellow woman. It projects a fellow woman's heartless treatment to her fellow sister on the question of motherhood or childlessness. It goes to confirm Obioma's (1997) assertion in a paper titled: “The Politics of Mothering”, where she observes that, it is a fact that in many African societies, women act as oppressive agents to other woman especially as co-workers, mothers-in-law, daughters-in-law, older women and step mothers. And just as Amaka's mother-in-law in Nwapa's *One is Enough* saw her as useless and destroyed her joy and love in marriage, because of her assumed infertility, so did Ogechi's mother-in law. This evil that breads inhuman acts on women by men, has a strong root among women and must be seriously paid attention to if walker's definition of feminism stands true among African women.

IX. RECOMMENDATION

The study recommends that the identity of a woman among her peers should not be determined by whether she has a child or not. In addition, an intentional effort be made to throw in voices into this voiceless area by feminists' proponents, in order to liberate some of these women who are treated as less than a human by other women.

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AUTHORS

First Author – Nwaugo Goodseed Ochulor, Babcock University, Ogun State, ugoseed@gmail.com
08167716516

A Plight to Descry: Data on Standby Waging a War on Poverty through Data Science

Amani Jridi

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I. INTRODUCTION

Data Science, a field that puts order into chaos, transforms the ambiguity of abstractions into tangible information, and moves beyond mere theories to introduce concrete changes in the world around us. Change! An abstract notion likely to become concrete if the promising developments this field has to offer are successfully implemented in developing countries where the infrastructure does not allow for a smooth use of the strategies and techniques opted for in developed countries. My article was initially inspired by Professor Joshua Evan Blumenstock's attempt at establishing an alliance between Data Science and Economy with the view of using the former as an efficient tool to eradicate poverty. Quoting Sendhil Mullainathan's thought-provoking condemnation of a system in which financial services are prioritized while aid services are discarded as secondary, Professor Blumenstock drew my attention to the fact that opting for a career in Data Science goes beyond the rigidity of numbers and statistics as it touches upon a humanitarian aspect that allows the scholar to carry out research that scrutinizes overlooked, so-called random details with the view of improving people's conditions and putting an end to their hardships. Haunted by a milestone event in which my country, Tunisia, played a leading role, namely, the Arab Spring, I immediately associated Blumenstock's ideas with the Tunisian context and reflected upon the prospects of applying it in various underprivileged marginalized regions of Tunisia where the pangs of regionalism have impeded the equal distribution of wealth, preventing thus the felicitous use of new technologies to collect data in peripheral areas where the infrastructure is either poor or nonexistent. This article aims thus at providing an outline delineating the different levels on which the Tunisian context provides a favorable terrain for the application of the aforementioned strategy as suggested by Professor Blumenstock. To start with, the latter's remark concerning the costly aspect of government-funded surveys in third world countries and the fact that they are often outdated is highly relevant as they are indeed expensive and relegated to the background compared to urgent priority issues that must be solved. In addition, corruption and lack of transparency are among the common factors marring policy-making in developing countries and undermining their credibility. Rebellious against totalitarianism, inequality, and poverty, Tunisians have succeeded in toppling a dictatorship but are still struggling, in a transition period, with the remnants of an old system which ways are deeply-rooted and hard to get rid of. Traditional surveys are therefore far from being reliable as they are distorted to serve

various agendas. These biased statistics undermine put the reliability of post-revolution governments into question and further highlight the necessity of adopting innovative new methods that policy-makers cannot toy with. The nightlight data technology, satellite photographs taken at night that capture light emitted from Earth's surface (1), devised by researchers as an alternative to traditional surveys may prove highly rewarding in the Tunisian context as satellite photographs have often proven that wealthier areas shine brighter (4). Underprivileged regions in Tunisia often suffer from poor electricity supply or utter lack thereof which further confirms the suitability of this strategy in the Tunisian context in terms of measuring wealth. Dubbed as "Shadow Areas" by Tunisian media, these rural regions dwell indeed in the shadow of few urban areas that monopolize wealth on the detriment of their provincial agrarian counterparts. Denied the basic human rights that would secure a decent life, the inhabitants of these regions endure deprivation, destitution, and discrimination. Professor Blumenstock also mentioned another innovative technique opted for by researchers to overcome the obstacles posed by the absence of an adequate infrastructure in developing countries, namely, the use of "digital footprints" left by mobile phone logs. Regional patterns of mobile phone use correlate with the regional distribution of wealth (10). This strategy is highly promising in the Tunisian context wherein mobile phones are indeed ubiquitous. Opting for this technique will indeed enable the deduction of accurate inferences regarding the socio-economic status of users provided that operators commit to this project while respecting their clients' privacy. In a country where the limits between the public and the private are rather hazy, infringing upon the territory of people's private lives is a constant threat that needs to be averted in order to avoid the risk of falling prey to a new dictatorship in disguise. Dodging one-sided approaches, Blumenstock sheds light on the limitations of some of the previously mentioned techniques. Nightlight data is a limited technology as satellite photographs do not reflect the differences between dark areas as they are shown equally dark. Even though he suggests daytime imagery as a solution for this drawback, a suggestion that seems highly plausible and offers a potential solution to the problem, the Tunisian context requires first the identification of underprivileged areas regardless of the degree of deprivation. In fact, on the National Institute of Statistics' website (Tunisia's statistics agency), key indicators such as unemployment, poverty, income per household are not differentiated by regions (4). A scale of destitution is no longer functional in a country that witnessed a revolution aimed at eliminating all forms of inequality as all regions should benefit equally from governmental development plans and progress

schemes. Measuring the inequalities between regions which have already fallen prey to inequality is only ominous of further division and strife in a country that needs unity to thrive.

Poverty rate by place of residence				
				Unit : Pourcentage
Indicator	2000	2005	2010	2015
Poverty rate (in %)	25.4	23.1	20.5	15.2
Communal area	16.6	14.8	12.6	10.1
Non-communal areas	40.4	38.8	36	26

Source : National Institute of Statistics **Updates:** 07/12/2017

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AUTHORS

First Author – Amani Jridi

Specific Allocation Funds, Economic Growth, and Unemployment: A Case Study in Banten Province, Indonesia

Sukanto*, Bambang Juanda**, Akhmad Fauzi**, Sri Mulatsih**

* Economic Development, Sriwijaya University

** Departement Regional and Rural Development Planning Sciences, Bogor Agricultural University

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Abstract- Specific allocation funds to the regions are still needed due to inequality of regional financial capacity. Areas with low financial capability are identical to those underdeveloped regions, which have relatively low levels of economic growth and high level of unemployment. This study analyzes the impact of specific allocation funds on economic growth and unemployment through the regional expenditure mechanism, using panel data from 2010-2015, while the simultaneous equation model is estimated using the Two Stage Least Square (2SLS) method. The results of the study indicate that the Specific Allocation Fund does not affect capital expenditures in the regency areas, but does so in the cities. Specific Allocation Funds have a significant influence on economic growth and unemployment through capital expenditure transmission. Going forward, the government needs to increase.

Index Terms- capital expenditure, dynamic simultaneous model, regional expenditure, specific allocation funds.

I. INTRODUCTION

Indonesia has implemented the practice of transfer funds since the old order experienced a drastic change after the 1998 reforms. Initially, the transfer of authority was only limited to the provincial level; but then in the reform era it became focused more on doing so to the regency/city level. The granting of authority to the regions to manage and regulate all government affairs outside of the central government's affairs is accompanied by a transfer of funds (money follows function), as stipulated in Law Number 33 Year 2004 on Financial Balance between the Central and Regional Governments. One of the objectives to be achieved from the policy of transfer funds from the central to the regions is to stimulate economic growth, which in turn will lower the unemployment rate, in order to create a prosperous society.

Various studies have been conducted to measure the effects of transfer funds; such as those performed by Hong (2010) in Korea, and Zhang and Zou (1998) in China, that found a negative relationship between fiscal decentralization and economic growth in provincial areas. Similarly, the results of Davoodi and Zou (1998) showed negative relationship between decentralization and economic growth for developing countries, while positive relationship was shown in developed countries. In addition, a study conducted by Xie *et al.* (1999) revealed that

fiscal decentralization has an impact on long-term economic growth in the United States. While Vasquez and McNab (2003) doubt if there is even a relationship between fiscal decentralization and economic growth. On the other hand, a study conducted by Waluyo (2007) in Indonesia showed that fiscal decentralization helps boosting the economic growth relatively better in areas that are the centers of business and areas that are rich with their natural resources, compared to those that are not business centers and those that are poor in natural resources.

The fact is, the amount of funds transferred to regions and villages throughout Indonesia continues to increase. During the period of 2010-2016, there was an average increase of 19.99% per year, even though economic growth tended to stagnate at 5.0%, and the unemployment rate only declined by an average of 0.16% per year. Similar phenomenon also occurred in Banten Province, where transfer funds in the same period had increased by an average of 39.49% per year. Even so, economic growth in this province has slowed to around 5.0% per year, unemployment has only decreased by 0.78% per year, and it is still an area with the highest unemployment rate in Java.

So far, there have not been many studies that emphasize the influence of transfers to the regions, especially specific allocation funds, even though the fund allocation focuses on infrastructure spending, which is believed to be able to increase economic growth and absorb labor. Based on these facts it is necessary to assess the impact of transfer funds, especially specific allocation funds, on economic growth and unemployment through regional spending behavior

II. THE METHODS

This research was conducted in Banten Province using secondary data from 2010-2015 in the form of panel data of eight regencies/cities in said province. The secondary data was obtained from the Directorate General of Fiscal Balance, which consisted of General Allocation Funds (DAU), Revenue Sharing Funds (DBH), Specific Allocation Funds (DAK), Locally Generated Revenues (PAD) and their components, and other Transfers. Regional expenditures consist of capital expenditure and expenditure of goods and services. Development performance is measured using economic growth and unemployment rates.

The data was processed using a simultaneous equation model which was constructed into four blocks (Figure 1); namely the regional income block, regional expenditure block, public service block (health, education, public works), and the block of economic growth and unemployment. These four blocks consist of twenty-three structural equations and three identity equations. The regional income block reflects the income received by the region, which consists of transfer funds, PAD, and other types of transfers. The behavior of regional income will affect the expenditures made by the region; and these expenditures will have an impact on economic growth and unemployment, both directly and indirectly through public services in said region. The simultaneous equation model is estimated using the Two Stage Least Square methods (2SLS) which is processed with Eviews9

software.

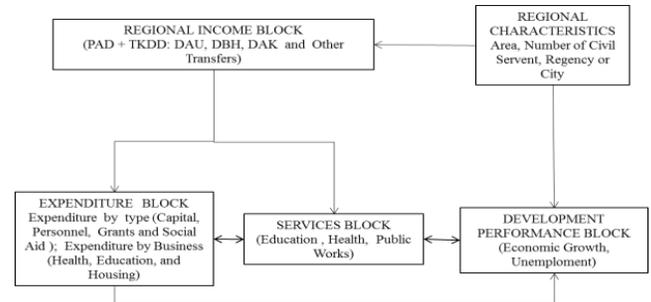


Figure 1. Simultaneous model framework

III. RESULT AND DISCUSSION

The contribution of transfer funds to the regional income

Funds that are transferred to the region in the form of a balancing fund consisting of DAU, DBH, DAK are still the source of income for regencies/cities in Banten Province. The proportion of DAU in each regency/city is still the highest, followed by regional income through DBH. Figure 2 provides information that DAU contributes the most to regional revenues. Pandenglang Regency is the region with the largest DAU contribution, which is 44.46%, followed by Lebak Regency with 43.73%. Meanwhile, the smallest contribution of DAU to regional revenues is recorded by South Tangerang City, which is 23.09%.

DAU contribution to regional revenues that is still high in several regencies indicates that regional financial capacity is still low. Balancing funds, especially the DAU, which are distributed to the regions eventually become a disincentive for increasing regional financial independence. Therefore, regional government is expected to be able to increase the sources of regional revenues, especially from DBH and PAD, to encourage regional fiscal capacity so as to reduce financial dependence on the central government.

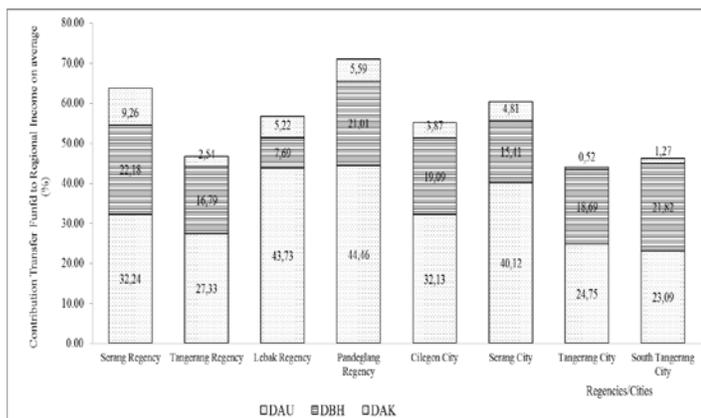


Figure 2. Average contribution of transfer funds to regional income of regencies/cities in Banten Province in 2010-2015

In addition, the government also provides DAK. Data shows that DAK has smaller contribution compared to DAU and DBH. The average DAK for regencies/cities in the Province during 2010-2015 was 4.13%. Despite having small value, DAK

is a form of bottom-up participatory planning, so that programs funded by DAK funds are needed by the community. DAK is used to improve infrastructure that is executed based on proposal from the region, so that it is expected to be able to encourage economic growth and open employment opportunities in the regions (Juanda and Hendra 2017).

The Impact of Transfer Funds on Regional Expenditures

Table 1 shows that goods and services expenditure (GSE) is significantly affected by DAU, PAD, and other legitimate income. The short-term elasticity of the DAU parameter is equal to 0.4603, which means that every time there is a 1.00% change in DAU, the expenditure on goods and services will increase by 0.4603%, with a long-term elasticity of 0.464. The second factor that influences the expenditure of goods and services is PAD. PAD has an inelastic short-term elasticity, which is equal to 0.3488; it can be said that every time there is a 1.00% increase in PAD, the expenditure of goods and services will increase by 0.3488%, with a long-term elasticity of 0.351. For some regions such as South Tangerang City, Tangerang City, Cilegon City, and Tangerang Regency PAD contributes more than 20% to their regional revenues. The increase in PAD will encourage the increase in regional spending, including spending on goods and services.

Table 1 Estimated Transfer Fund to Local Expenditures

Independent variables	Dependent Variables			
	LogGood and Services Expenditures (GSE)	LRE	LogCapital Expenditure (CE)	LRE
Constanta	-0.0967		-3.6442	
LogGeneral Allocation Fund (DAU)	0.4125***		1.2500	
LogSpecific Allocation Fund (DAK)	0.1122		0.0332	
LogRevenue Sharing Fund (DBH)	0.0575		0.0592	
LogOwn Resources Revenue (PAD)	0.401***	0.4038	0.6147	
LogCivil Servant (PNS)	0.2766***			
LogOther Transfers (Otr)	0.3244***	0.3270	-0.0532	
LagGood and Services Expenditures_1	0.0079			
LagCapital Expenditure_1			0.0601***	
LogGeneral Allocation Fund (DAU)*D1			-1.1726	
LogSpecific Allocation Fund (DAK)*D1			0.719***	0.7473
LogRevenue Sharing Fund (DBH)*D1			-0.2313	
LogOwn Resources Revenue (PAD)*D1			0.0688	
LogOther Transfers*D1			-0.0387	
LagCapital Expenditure_1 *D1			-0.0066	
Adj. R-squared	0.9132		0.7668	
Durbin Watson	1.5188		2.4138	

LRE = long run elasticity

* indicates $\rho < 0.1$; ** indicates $\rho < 0.05$; *** indicates $\rho < 0.01$

If the elasticity between DAU and PAD is compared, it is seen that the pattern of goods and services expenditures is more likely to be influenced by DAU. This implicitly shows that regional revenues are still dominated by the acceptance of DAU. Meanwhile, factors from other income also have a significant effect on goods and services expenditure, with an elasticity of 0.3244 (in other words, it is inelastic), which means that every 1.00% increase in other legitimate income will be responded by an increase in spending on goods and services as much as 0.3244%. On the contrary, DBH actually shows a negative relationship with goods and services spending, albeit insignificant. The analysis shows that the DBH contribution in regional income of regencies/cities in Banten Province is still relatively low.

Table 1 also illustrates the effect of lag on the previous year's capital expenditure (CE) on the capital expenditure pattern, while other variables are not significant.

However, if described in detail using regency and city area dummy variables, the equation for capital expenditure for the regency government ($D1 = 0$) is as follows:

$$\text{LogCE} = -3.6442 + 1.2500\text{LogDAU} + 0.0332\text{LogDAK} + 0.0592\text{LogDBH} + 0.6147\text{LogPAD} - 0.0532\text{logOTr} + 0.0601\text{LogCE}_1$$

While the capital expenditure equation for the city government ($D1 = 1$) is:

$$\text{LogCE} = 0.0774\text{LogDAU} + 0.7522\text{LogDAK} - 0.1721\text{LogDBH} + 0.6835\text{LogPAD} - 0.0919\text{logOTr} + 0.0535\text{LogCE}_1$$

The above equations reveal that DAK has a significantly positive effect on capital expenditure in the city areas, while it has no effect in the regencies. The long-term elasticity of DAK to capital expenditure for the city government is much higher compared to its short-term elasticity. The city government's short-term elasticity is 0.7190, which implies that every 1.00% increase in the DAK will be responded by an increase in capital expenditure as much as 0.7190%, whereas the long-term elasticity shows a greater influence, equal to 0.7522; which means that in the future the amount of DAK funds needs to be considered.

The difference of DAK influence in regencies and cities is that cities have better quality of DAK management (human resources) and also the portion of capital expenditure is larger in the cities than it is in the regencies. In the future, even though the DAK portion is smaller in fiscal balance, it plays a strategic role in the development that demands a more active regional participation, since it is in line with the principles of decentralization and accountability for the provision of basic community services (Bappenas 2011). This study supports the results of researches conducted by Arwati and Hadiati (2013); and by Juanda *et al.* (2017), both state that DAK has a significant effect on capital expenditure.

The study showed that DBH has no effect on capital expenditure, which indicates that in actuality regencies/cities are incapable of being independent, since DBH is one of the

benchmarks in assessing the regional financial independence. DBH in the southern part of Banten Province is still very small, both originating from natural resources and taxes, therefore the government's commitment to increasing the sources of regional revenue is needed.

The Impact of Transfer Funds on Economic Growth and Unemployment

The study results show that capital expenditure and economic growth lag have a significantly positive effect on economic growth. Short-term elasticity of capital expenditure is equal to 0.0024, which means that for every 1.00% increase in capital expenditure there is an increase in economic growth by 0.00243%. These results support the researches conducted by Xie and Zou (1999); and by Pose and Ezcurra (2009), who both state that government spending tends to increase economic growth. The same opinion was expressed by Gupta *et al.* (2014), stating that capital spending contributes to economic growth.

Theoretically, the inflation rate has a positive effect on economic growth, as expressed by Blancard (2011); that rising prices will cause companies to increase their output, so as to absorb more labor. The large amount of labor at work has resulted in reduced unemployment, thereby increasing purchasing power and encouraging increased consumption, which in turn is followed by an increase in economic growth. The study results show that the inflation rate does not significantly affect economic growth.

At the same time, however, private investment has a negative and significant effect on economic growth, thus making it contradictory to the theory. Short-term elasticity of private investment is equal to -0.0045, which means that private investment has not yet influenced the economy of regency/city governments in Banten Province. This result is reinforced by the distribution of data which revealed that private investment in Banten Province during 2010-2012 was still agglomerated in the northern part of the region. Meanwhile, large-scale private investment in the southern part of the region has only begun since the establishment of the Tanjung Lesung Special Economic Zone in 2012 in Pandeglang Regency, and the construction of the "Merah Putih" Cement Plant in Lebak Regency. The impact of these two investments has not been experienced by the southern part of the region, therefore a relatively long time lag is needed to be able to measure the influence of private investment in said region.

The study also found a significantly negative relationship between economic growth and unemployment rate. The elasticity of economic growth for both short and long term is inelastic. When compared between the two, the long-term economic growth (-0.3298) gives a greater influence on unemployment than that of the short term, which is equal to -0.0911. (Table 2). This result is in line with the research conducted by Erickson (1997), who points out that there is a trade-off between economic growth and unemployment. Meanwhile, Schubert and Turnovsky (2018) revealed that the trade-off between economic growth and unemployment is big in the short term but gets smaller in the long term. This means that the regional government must maintain the stability of economic growth to reduce unemployment rate.

The labor force participation rate shows a negative influence on economic growth in Banten Province. This indicates that the ongoing economic growth has not been able to absorb labor. This argument is reinforced by the results of previous analysis which showed high unemployment in Banten Province, especially in industrial centers such as Cilegon City and Tangerang Regency. Industries operating in the Cilegon and surrounding areas are capital intensive, which requires skilled labor. The trickle down effect phenomenon has not yet fully occurred in the centers of economic growth in Banten Province.

Table 2 Estimated Transfer Fund to Economy Growth and Unemployment

Independent Variable	Dependent variable			
	Economy Growth	LRE	Unemployment	LRE
CConstanta	-5.0089**		30.4482	
LogLabor Force Participation Rate			-4.2163	
LogCapital Expenditures	0.3927			
LogGood and Services Expenditures	0.0024***	0.0026	-0.0072**	-0.0073
Regional Dummy	0.0016*			
Inflation	-0.0468			
LogPrivate Invesment	-0.0298	0.0049		
LogRegional Minimum Wage			-0.0100	-3.618
Average length of years spent at school			-2.4115	
Economic Growth			-0.0911*	-0.3298
LagUnemployment_1			0.7238***	
LagEconomic Growth_1	-0.0762***			
Adj. R-squared	0.9465		0.6124	
Durbin Watson	2.3486		2.4824	

LRE= long run elasticity

* indicates $\rho < 0.1$; ** indicates $\rho < 0.05$; *** indicates $\rho < 0.01$

The results of the study also point out that the unemployment rate has become a priority of the Banten Provincial Government, as stated in the documents of Regional Mid-Term Development Plan (RPJMD) from 2012-2017 and from 2017-2022. The open unemployment rate in Banten Province is recorded above the national level and is the highest in Java. The estimation results in Table 2 show that the factors that significantly give a negative effects on the unemployment rate are capital expenditure and economic growth, whereas unemployment lag actually has a positive effect. Capital expenditure is negatively related to the unemployment rate, which shows that capital expenditure by the government tends to reduce unemployment. Capital expenditures used to open access for regions that have been isolated will increase regional economic activity.

The estimation results reveal that the short-term elasticity of the capital expenditure is -0.0072, which means that for every 1.0% increase in capital expenditure, the unemployment rate will decrease by -0.0072%; this is in line with the research conducted by Zakaria (2015) which states that the bigger the amount of capital expenditure issued by the regional government, the greater the effect will be on the reduction of the unemployment rate.

The results also show that the average length of years spent in school has a negative coefficient on unemployment, which means that the higher the level of one's education, the more

likely it is to reduce the unemployment rate. Yumna *et al.* (2017) revealed that educational inequality turned out to have a more important role in influencing unemployment. Concerns about educational inequality are also included in the findings of Agrawal (2014) study in India, which is why infrastructure improvements in education are needed. The argument is in accordance with the conditions that exist in Banten Province, where the results of the analysis indicate that there is a very huge gap between regencies/cities in terms of average length of schooling. The southern part of the region has an average of only 6 years of schooling, while the northern part has reached almost 12 years. The Net Enrollment Rate (NER) also shows a fairly sharp gap between regencies/cities for secondary education; in the southern part, the NER for senior high school is still around 50.0%, while in the north it has reached 70.0%. In general, the results of this study confirm the research conducted by Yanthi and Marhaeni (2015), which states that education has a negative effect on unemployment.

Similarly, the variable for per capita Gross Regional Domestic Product (GRDP) has a negative influence on the unemployment rate. In theory, an increase in per capita GRDP will stimulate an increase in economic activity, thus creating jobs. Extensive employment opportunities have an impact on reducing unemployment, even though these two variables are insignificant.

IV. CONCLUSION

Transfer funds through specific allocation funds have a significant effect on capital expenditure in the city areas, but not so much in the regency areas. This is caused by; (1) the relatively low quality of human resources in regency areas; and (2) the large proportion of capital expenditure in city areas. Capital expenditure tends to reduce the unemployment rate and increase the economic growth in Banten Province. Going forward, local governments need to prioritize capital expenditure through physical DAK for underdeveloped regencies, in order to increase regional connectivity to encourage economic growth and to reduce unemployment.

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AUTHORS

First Author – Sukanto – Economic Development, Sriwijaya University, soekanto0813@fe.unsri.ac.id

Second Author – Bambang Juanda – Departement Regional and Rural Development Planning Sciences, Bogor Agricultural University, bbjuanda@yahoo.com

Third Author- Akhmad Fauzi – Departement Regional and Rural Development Planning Sciences, Bogor Agricultural University, fauziakhammad@gmail.com

Fourth Author Sri Mulatsih – Departement Regional and Rural Development Planning Sciences, Bogor Agricultural University, mulatsupardi@gmail.com

Correspondence Author – Soekanto0813@fe.unsri.ac.id, soekanto0813@gmail.com, +6281367506158.

A Compact Control Circuit for Electric Furnace

Chandam Thoisana Singh

M.tech,1st semester, Electronics & Communication Engineering, National Institute of Technology, Manipur

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Abstract- This paper presents a design of a compact control circuit for electric furnace, a low voltage power supply (6V unregulated) is utilized to supply the dc Voltages of the system, the circuit is design to produce a fixed selected time frame of 200ms containing 10 complete cycle of main ac voltage. In this time frame on (high) period is 194 ms and off (low) period is 6ms. During the on period a selected short burst of ac cycles can be made to pass through the load by triggering the power triac.

Index Terms- phase control, zero point Switching, design, input and output waveforms.

I. INTRODUCTION

Electric furnace using heating element (nichrome) can be controlled in the following manners;

- a) By varying ac voltage or current.
- b) By intermittent Switching of the ac power supply.
- c) By zero point Switching.

First case: The ac power dissipation is controlled by varying the load current

Here, the power $P = I^2R$, Where $I = \text{Load}$

$R = \text{Hot Resistance of the heating element}$

Since the load current I can be varied by the controlling circuit, the power P can also be varied correspondingly. During a specified time frame 't' the heat energy conversion 'H' is given by

$H = (\text{Electrical work done divided by mechanical equivalent of heat energy})$

$H = (I^2Rt)/j$, (Where $j = \text{mechanical equivalent of heat energy} = 4200\text{Kcal./joules}$)

Therefore, $H = (I^2Rt)/4200\text{Kcal}$ (1)

Here, $H \propto I^2$ (2)

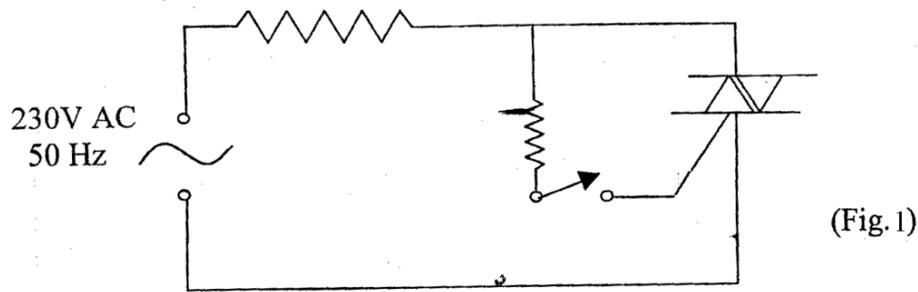
Disadvantage: 1) IR drop (Which result in loss of power)

2) Use of toroidal variac transformer (which is bulky and costly)

Second Case: The time 't' during which the full load current I_0 flowing through the heating element is varied in a controlled quantum according to our requirement of heat energy

Thus the heat energy conversion is directly controlled as per our requirement by varying the on time ' t_{on} ' of a switch connected in series with the load an ac power supply

Now the Eqn.1 becomes $H \propto t_{on}$ (3)

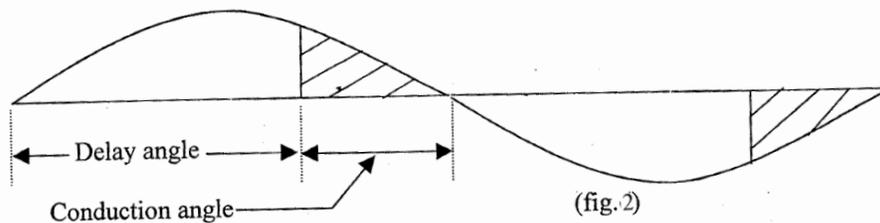


Disadvantage; 1) Frequently on and Off of a switch, which is not desirable.

Third Case: The switching arrangement is improved by using a zero crossing ac switch and keeping a selected time frame constant and periodical. The time frame consist of on and off time of the heat controlling switch which are variable. The on time 'ton' is varied accordingly to our heat energy requirement. The eqn. 3 still stands for heat energy conversion.

Method of Control:

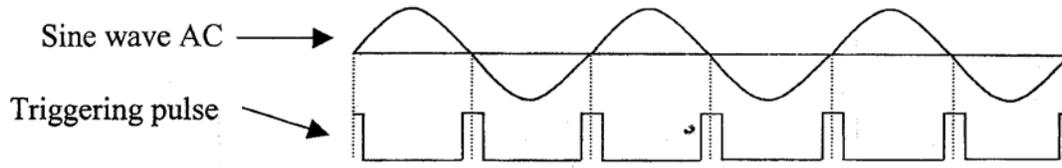
Phase control: Here the triac switch on the ac voltage to the load for a controlled fraction of each cycle, in this mode of operation the device is held in off state for a fraction of both the positive and negative half cycle and then is triggered into on state at the instants in both the half cycle as determine by the control circuit as shown in figure 2 .In the on state condition the circuit current limited by the load resistance and the rms value of the conducting fraction of the cycle less by the forward voltage drop of the device is applied to the load.



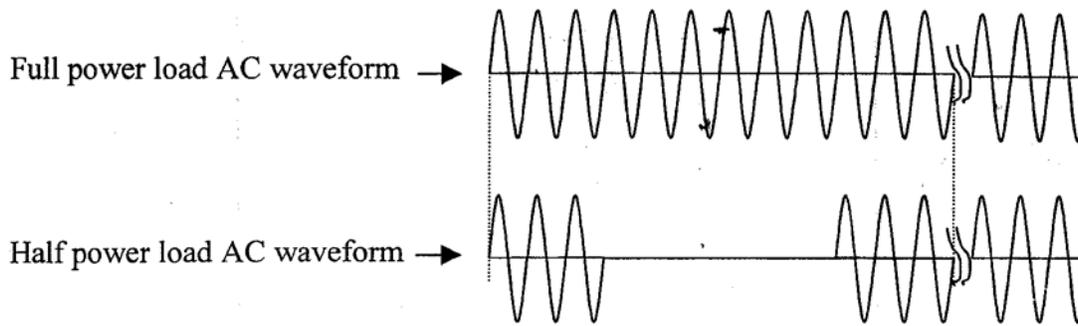
As shown in fig.2, the delay angle is the angle measure in electrical degrees during which the triac is blocking the line voltage. The period during which the triac is in on state is called the conduction angle.

- Disadvantage:** 1) Generation of unwanted EMI noise.
2) Power loss during the on-off transients is also maximum

Zero point switching: This method minimized the power loss as well as the EMI which is often usable. In this technique the control element is gated on at the instant, the sine wave voltage goes through Zero. This reduces or eliminate the turn on transient loss and EMI. Power to the load is controlled by providing a suitable length of bursts of complete sine wave to the load as shown in fig. 3.



(Fig. 3a) Zero point triggering



(Fig.3b)

So, for the effective control of heat energy of an electric furnace, Zero point switching circuit is the best option

CIRCUIT

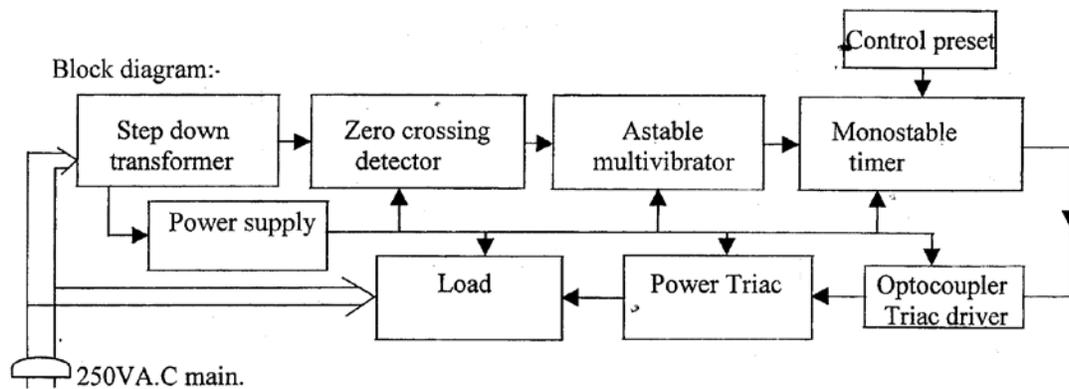


Fig. 4 Zero point switching circuit

DECRPTION :

A 6V -0- 6V step down transformer is used to derive the working dc voltages of the following stages. Diode D1, D2 full wave rectified the secondary ac to give a pulsating dc of twice the light frequency at the point A. A 470 μF capacitor filtered the ac component to give an unregulated working dc voltage of approx. 7.8V under the loaded condition. The diode D3 prevent the filtering of pulsating dc at the point A by the filtering capacitor of the circuit.

An NPN transistor Q1 as zero crossing detector of the main ac waveform. At the point B, a narrow pulse of 2ms produced exactly at the zero points of the IC555 forms an astable multivibrator, which determined the time frame of the triac switching, the time frame

is 200ms. This time frame consists of 194ms high period and 6ms low period at the point D is phase synchronized with the rising edge of the zero point pulses available at the point B. It done by giving a differential pulse to the point C at which the frequency determining voltage of the astable circuit is controlled.

Again the falling edge of the 6ms low period of the time frame triggers the monostable circuit of the IC555. A 555IC have no facilities of triggering during its quasistable period. However the set pin is protected from false triggering by unwanted transients with the help of networks D4(IN4148), 1KΩ and 0.01μf.

$$\text{The quasistable time } \tau = R_T C_T \quad (4)$$

The maximum value of τ is limited to 200ms so as not to create false aliasing effect of the system.

CIRCUIT DESIGN:

Q1 is the zero crossing detector its design is very simple. Every time the dc crossing points it is in cut off mode. For this we select suitable value of collector current (I_c) in the saturation mode.

For a full wave rectification the average value is,

$$\begin{aligned} V_{av} &= (2V_m)/\pi \\ &= (2 \times \sqrt{2} \cdot 6)/\pi \\ &= 5.4 \text{dc} \end{aligned}$$

We select $I_c = 5.1 \text{mA}$ for simplicity of the calculation.

$$\begin{aligned} \text{So, that } R_c &= V_{cc}/I_c \\ &= 7.8\text{V}/5.2\text{mA} \\ &= 1.5\text{k}\Omega \text{ exactly.} \end{aligned}$$

Taking $I_b = I_c/10 \text{mA}$ for hard saturation

$$\begin{aligned} R_b &= 5.4/I_b \\ &= (5.4 \times 10 \times 10^{-6})/5.2 \\ &= 10.38\text{k}\Omega \end{aligned}$$

astable multivibrator;

Taking $C = 100\mu\text{F}$

$$\begin{aligned} \text{Discharge time} \\ T_D &= 0.693 * R_2 C \\ 6 * 10^{-3} &= 0.693 * R_2 * 100 * 10^{-6} \\ R_2 &= 86.6\Omega \\ R_2 &= 1\text{K}\Omega \end{aligned}$$

Charge time (for high o/p)

$$\begin{aligned} T_c &= 0.693 * (R_1 + R_2) C \\ 194 * 10^{-3} &= 0.693 * (R_1 + 1000) 100 * 10^{-6} \\ R_1 &= 1799.42\Omega \\ R_1 &= 2\text{K}\Omega \end{aligned}$$

For, monostable circuit the quasistable time,

$$\tau = 200\text{ms (limited) max}$$

But, from the equation (12)

$$\begin{aligned} \tau &= R_T C_T \\ \text{Therefore, } 200 * 10^{-3} &= R_T * 2 * 10^{-6} \\ R_T &= 100 \text{K}\Omega \text{ (for the Maximum limited value when } C_T \text{ is taken as } 2\mu\text{F).} \end{aligned}$$

But most of the potentiometer available in the market does not give the exact rated value. Hence for the correction of the potmeter value a fixed resistor of suitable value is selected for the connection in series with it.

For the triac driver circuit the pin no.2 of the MOC6041 needs an inverted drive pulse for the conduction of the associated photodiode inside the IC. Q_4 is used to drive the forward current of it. As given in the data sheet of the IC the reverse voltage is limited to 5V (designed value is taken less than the maximum value) by clipping the d.c voltage given to the pin no.1 at 5V using a zener diode and 100uF capacitor. The diode forward current I_F is limited to 50mA (less than the maximum value) by a 100Ω limiter

For the selection of power triac, the load is selected as 1000W heater. Therefore, the full power load current,

$$I_0 = 1000\text{W}/250\text{V} = 4\text{A}$$

Transformer :

1) T1 = 6V-0-6V(500mA)	0.25 Watts	1 no.
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Capacitor :

2) 470 μ F/16 V	0.25 Watts	1 no.
3) 1 μ F/25V	0.25 Watts	1 no.
4) 100 μ F/16V	0.25 Watts	1 no.
5) 0.1 μ F	0.25 Watts	1 no.
6) 0.01 μ F	0.25 Watts	2 no.
7) C _T =2 μ F/25V	0.25 Watts	1 no.

IC :

8) LM555	0.25 Watts	2 no.
9) MOC3041	0.25 Watts	2 no.

Triac:

10) 2N6432	0.25 Watts	2 no.
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Transistor:

11) BC148B	0.25 Watts	2 no.
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POINT REPRESENTATION:

Point A: Shows a pulsating of dc of twice the line frequency ($2*50=100\text{Hz}$).

Point B: Shows a narrow pulse of 2ms produced exactly at the zero points of the ac cycles.

Point C: A differential pulse is provided at point C at which the frequency determining voltage of the astable circuit is controlled.

Point D: Shows the time frame of the triac switching determined by the astable multivibrator.

Point E: Shows the change in time frame of 250ms high and 150ms low periods.

The phenomenon of physical verification is explained in fig.6

OUTPUT AND RESULTS:

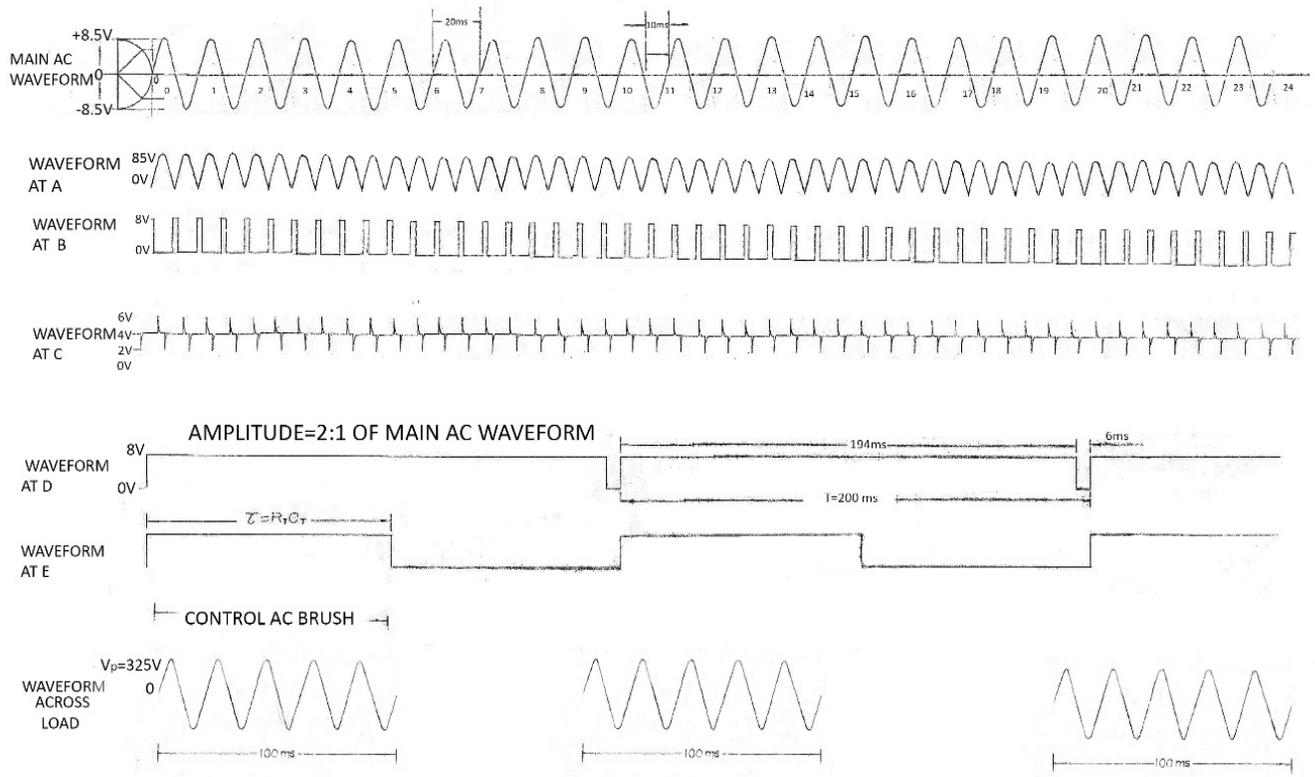


FIG:6- WAVEFORM DIAGRAM SHOWING THE AC BURST CONTROLLED LENGTH

II. CONCLUSION

A compact electric furnace control circuit is proposed in this paper. The circuit is modified from earlier version by using 555 timer instead of BJT for the design of astable multivibrator. The circuit produces good result thereby reducing the size and complexity of the circuit.

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AUTHORS

First Author – Chandam Thoisana Singh, M.tech,1st semester, Electronics & Communication Engineering, National Institute of Technology, Manipur

Lecture Timetable Scheduling Software

BY

Ebieto, C. E

Department of Mechanical Engineering,
University of Port Harcourt, Port Harcourt, Nigeria.
Email: celestine.ebieto@uniport.edu.ng; Phone: 08037728846

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ABSTRACT

In this paper, computer software is designed for optimum scheduling of timetable for courses in educational institutions. This system uses Dynamic Slot Algorithm (DSA) with the application of Constraint Satisfaction Programming. The algorithm was transformed into a program using Microsoft Excel-visual basic for application (Excel-VBA). It has been used for the timetable of the Faculty of Engineering, University of Port Harcourt. Results obtained are better than those generated manually by the human timetabler as they show a much higher space and time utilization, apart from the great speed associated with computer productions.

Key words: Excel Add-Ins, Computer software, Excel-VBA, Constraint Satisfaction Programming, Timetable.

INTRODUCTION

Timetable scheduling is the problem of assigning courses or examinations to periods

and to classrooms. Although the course and examination timetables are related to each other, they can be quite different. For example, generally, it is possible to have more than one examination on in a large examination hall at any particular time, whereas it would be extremely unlikely that lectures (courses) on more than one course would take place in the same hall, no matter how large that hall is. This means that, practically, the examination timetable scheduling process must be carried out centrally by the institution. Therefore the examination timetabling problem is a subset of the course timetabling problem.

The automatic timetable construction is within the sphere of combinatorial search algorithms [1]. Particular techniques which have been used to deal with the search problems include integer programming [2]; genetic or evolutionary algorithms [3,4]; and simulated annealing [5]. However, each of these techniques plagued by a shortcomings ranging from performance unreliability, blurred search landscapes, and high resource utilization [6,7,8].

There are currently many different solution generation algorithms in existence. Some are so well known that they are the subject of standard textbook material [9,10]. Linear and integer programming techniques [11,9] the first applied to timetabling were developed from the broader area of mathematical programming. In the 1970's IP was identified as being less efficient than linear programming (LP) for solving

optimization problems but was still considered to be a good problem solving technique [12].

Evolutionary algorithms (EAs) are a class of direct, probabilistic search and optimization algorithms gleaned from the model of organic evolution. It is a problem solving and optimization method that uses genetics as its model problem and applies the rules of reproduction, general crossover and mutation to pseudo-organizations so that those organizations can pass beneficial and survival-enhancing traits to the new generation [3]. It is claimed that Genetic Algorithms have a greater capacity than any other search method in finding the largest number of possible solutions and depict the best possible results [4]. However, GAs still fall short in the choice of control parameters, the exact roles of crossover and mutation, and the characterization of search landscapes for optimization and convergence characteristics [7].

Constraint Satisfaction Programming (CSP) is a relatively new technique for dealing with search problems [13,14]. It involves searching for the values of problem variables subject to constraints on their feasible combinations. In some cases, the satisfaction of the constraints leads to conflicts with the problem objectives. Thus, only the solution of the sub-problem (by satisfying a subset of the constraints) is possible, if the problem objectives must be met; this is the case of Partial Constraint Satisfaction Programming (PCSP). PCSP with dynamic slot algorithm (DSA) is a particular application of CSP which is an algorithm where the process of finding solution to a problem is dependent on the strategy chosen. Therefore, it involves the theory of multistage decision process where the overall problem with n variables is sub-divided into n sub-problems, each sub-problems being a decision making problem in one variable. The optimal solutions of these sub-problems can now be used to find an optimal solution to the overall problem. The major advantages are as follows: (i) constraint propagation reduces the search space so it takes less time to search thus

minimizing backtracking; (ii) memory requirement is smaller since the search space has been reduced; (iii) all available resources are represented in the form of constraints and hence user preferences and requirements can be easily satisfied.

This paper, therefore presents an Excel-VBA based computer software for scheduling lecture timetable in educational institutions by partial constraint satisfaction programming with dynamic slot algorithm. It is then applied for the special case of lecture timetabling of the Faculty of Engineering lectures at the University of Port Harcourt.

METHODOLOGY

The Timetabling Problem

The timetabling process consists of two distinct phases:

- The curricula, that is, lists of courses, are defined for each class and various resources (manpower and/or equipment) are assigned to them.
- A detailed timetable is composed which is compatible with the previously defined requirements and with some additional constraints as well.

The second phase is the one which is usually referred to as the *timetabling problem*. Due to the complexity of this problem, it is worthwhile trying to solve it by a computer instead of tackling it manually.

The timetabling problem involves scheduling some relations that can be obtained between finite specific resources such as lecturers, students, classrooms, hours, and courses with the respect to some *hard* and *soft* constraints. The main differences between the *hard* and *soft* constraints is that Hard constraints are those constraints we cannot violate, while Soft constraints are constraints that we can pass sometimes but it is preferable not to do so and every time we violate them, it reflect in our result.

Some examples of hard constraints are:

- A lecturer can only teach in a single place at a time.
- A lecturer can only give one lecture at a time.
- A venue can only host one lecture at a time.
- A student can only attend one lecture at a time.
- Class room capacity must be respected.
- Not more than one lecturer is scheduled to hold in a classroom at a time.
- Each course is scheduled in a proper room (for example, a laboratory course needs proper laboratory).

Some examples of soft constraints are:

- A lecturer should not teach more than 6 hours a day.
- A student should not have more than 8 hours a day.
- There should not be unnecessary gaps in the activity of the lecturers.
- There should not be unnecessary gaps in the activity of the students.
- The courses should be scheduled in the morning and laboratories in the afternoon.
- Some lectures are scheduled *a priori*.
- As much as possible the preferences of the lecturers and the ones of the students should be respected.
- Launch break should be respected.

LTSS – A Timetable Construction System

LTSS (Lecture Timetable Scheduling Software) uses a Dynamic Slot Algorithm (DSA) which is a method for reducing the runtime of algorithms exhibiting the properties of overlapping sub-problems (that is the same sub-problems are used to solve many different larger problems) and optimal substructures (that is, the optimal solutions of sub-problems can be used to find the optimal solutions of the overall problem).

DSA also apply memoization which involve saving the solution to problems that have already been solved so that if we need to solve the same problem later, we can retrieve and reuse our already computed solution. A number of assumptions and constraints have been taken into consideration to meet the requirement of the Faculty of Engineering University of Port Harcourt.

More specifically, four main assumptions have been considered:

- Each course is split into two or more lecture time depending on its credit unit
- Each course can be lecture, practical or both; lecture Courses are taught in class rooms, whereas practical courses are performed in laboratories or workshops. Each course (lecture or practical) assumed to have a fixed class size.
- Each course belongs to a specific level of study (year) and falls under one out of five separate levels (year 1, year 2, year 3, year 4, and year 5); and the courses in each year are further classified as General, Interfaculty, Faculty, or Departmental in that order of priority.
- General courses are done by only year 1 students; and all Departments take the same courses in year 1.

Apart from these conditions, five main constraints have been taken into consideration:

- No two lectures can be scheduled the same day and period of time in the same venue.
- No two courses belonging to the same level of study should overlap if they are for the same Department or the entire Faculty.
- No two lectures should be given by the same lecturer at the same time. Moreover no lecturer should be assigned a lecture immediately after a lecture if the two lectures are at different campuses.

- The lecture venues allocated for a particular course should be large enough to fit the student class size.
- If a faculty course has been scheduled in a particular time, no other departmental course of the same level should be scheduled at that time.

Three basic criteria have been set in LTSS, which of course can be easily expanded and improved:

- In other to achieve the best utilization of each venue, it is desirable that each course is scheduled in a venue with enough capacity to accommodate the number of students attending this course.
- It is desirable that all courses belonging to the same level, if scheduled in the same day, should be taught in periods of time with minimum gaps between them as possible.

Solution Generation

The problem depicts each department as offering several courses per semester and each course having a specific period/duration in hours per week (corresponding to the credit units). Each of the specified periods can thus be defined as the contact hours between lecturers and students from a specified time and at a particular venue.

The timetabling problem can thus be defined as an assignment of time t_j , $1 \leq j \leq m$ and venues v_k , $1 \leq k \leq p$ to courses $S(i)$, $1 \leq i \leq n$ taught by lecturers $L[S(i)]$ such that all constraints $C[S(i)]$ are satisfied; where $L[S(i)]$ and $C[S(i)]$ are lecturers of and constraints on courses, respectively; m , p , and n are integer variables. Thus, generally, the CSP for a timetabling problem is as follows:

1. A finite set of variables, $X_1-----X_n$
2. For each variable X_i a set of domains $D_1-----D_n$ containing possible values of X_i .

3. A finite set of constraints, $C_1-----C_q$ representing relations between variables.

A solution to the constraint satisfaction programming (CSP) involves assigning values from domains of all variables such that all constraints are satisfied.

These values for the domains are generated using a Random function as shown below:

$$X = ((v * rnd) + 0) \tag{1}$$

where:

v is the number of venues and the days available

rnd is the generated random number

The following function was constructed for this work to test the value of the timetable. The value of a timetable $V(t)$ is given by:

$$V(t) = N - P - Q \tag{2}$$

where:

N is the number of classes assigned to the available venues (excluding the unconstraint venues).

P is the number of classes with conflict.

Q is the number of classes that could

not be schedule.

This function, although discrete, will have a maximum value equal to C , the number of lecture scheduling that need to be made. Its minimum value must necessarily be greater than $-C$. when the function $V(t)$ is applied to the timetable scheduling; the value of the function continually drops as C increases.

The implementation described in the work, being that we are using a constraint satisfaction programming algorithm, never generated any value for P (by design, no classes will be schedule that will result to a clash). However, as the number of classes to schedule increased, the algorithm took longer time to generate solution. Finally, it was interesting to note that even though large values of C often resulted in the algorithm not finding a complete solution, the algorithm was always able to schedule more

than 50% of the available courses (at 50%, $V(t)=0$).

Implementation

The software LTSS (Lecture Timetable Scheduling Software) is quite flexible and it provides the user with a windows environment interface which is designed so that it can be easily handled by a non-expert. The user create the database for courses, lecture venues and laboratories that will be included in the timetable or create his/her own data by modifying (i.e. adding, removing or changing) some of the data's that is already in the database. He/she is also required to set the constraints concerning the availability of lecture venues (i.e. define the days and periods of time in these days in which they are available) if applicable to any of the venues while venues that are not constraints are given all the days of the week. As soon as the creating of the database stage has been completed, you will be required to choose if there is any preferential course you will want to schedule (i.e. these are General or Inter-Faculty courses with a fixed time and days of the week. These courses can not be altered).when you are true if any preferential course, the main process starts which includes the following:

- You select a particular Department (according to priority) to schedule which automatically displays the courses offered by that department then you select a course to schedule and enter the class size.
- The system checks with the available venues for that department, the venues that meet that class size and select a venue from the list and also checks if that selected venue is a constraint venue or not.

- The program traverse through the search spaces via recursion with backtracking upon constraint failure until there is an optimum solution. However, if it cannot find a solution due to lack of venue, the program terminates notifying the user that there is no venue for that course.

When all these steps have been successfully completed for all unscheduled courses, the solution is displayed on an Excel spreadsheet and printed on a printer device.

RESULTS AND DISCUSSION

For a timetable scheduling software to be complete, a flexible user interface should be provided, so that the specific requirement of the problem can be stated (courses, venue available, etc.). LTSS provides such an interface.

The LTSS interface has been developed using Microsoft excel-visual basic for application (Excel-VBA). The interface allows the user to define the software parameters as preferred. Not only does it make it possible for the user to enter the particular courses, etc. that are to be Scheduled, it also enables the dynamic slotting of the course.

After successful installation of the software as an Excel-Add-Ins, click on the Time-Table menu on the menu bar and then click on the Start button of the Time-Table menu as shown in figure 1.

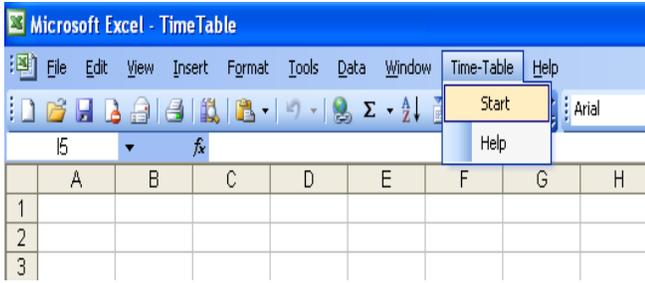


Figure 1: Excel worksheet showing the start drop menu

By clicking on the start button of the Time-Table menu we see the window of figure 2. click proceed to move to the next window (figure 3) where you will be required to enter the session, semester, and faculty (this is because we intend to expand the scope to the university at large but for this case you click on Engineering) you are scheduling the timetable for. You first click on Database (figure 3) to build your database (figure 4) if there is no existing database or if you want to make any changes to an existing database. When through with building the database, you click previous to return to the formal environment (figure 2) and click Build timetable to move to the final stage (figure 5) where you carry out the scheduling. However if there are preferential courses to schedule, you can either move from figure 2, depending on how you responded to the questions on clicking Build Timetable or you can move from figure 4 by clicking Go to preference on the environment to get to the preference Environment (figure 6).

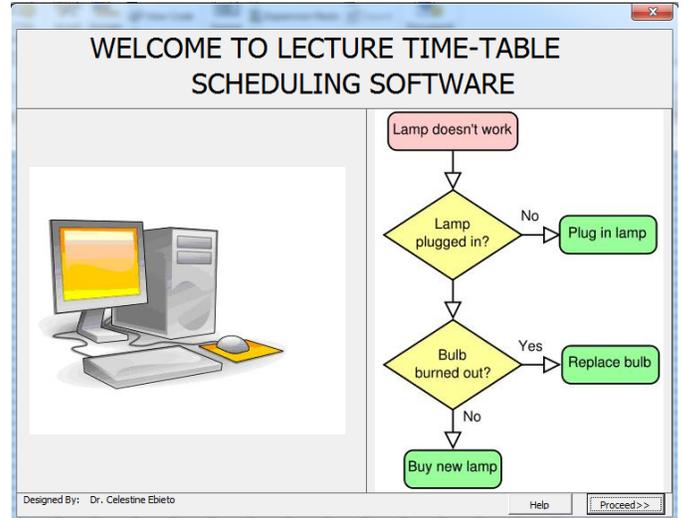


Figure 2: LTSS Welcome Interface

The image shows a window titled 'TimeTable'. It has three input fields: 'Session' with the value '2006/2007', 'Semester' with a dropdown menu showing 'First Semester', and 'Faculty' with a dropdown menu showing 'Engineering'. At the bottom, there are three buttons: 'Build TimeTable', 'DataBase', and 'Exit'.

Figure 3: LTSS Initializing Interface

The image shows a window titled 'Faculty Of Engineering Course Registration'. It has a 'Department' dropdown menu set to 'Faculty Courses'. Below are two sections: 'Course Details' and 'Teaching Details'. 'Course Details' includes 'Course Code' (ENG 201.1), 'Course Type' (Lecture), 'Credit Unit' (3), 'Semester' (1), and 'Level' (200). 'Teaching Details' includes 'Teaching Group' (Engineering) and 'Lecture Type' (Faculty Courses). At the bottom, there are buttons: '<< Previous', 'Add', 'Clear', 'Edit', 'Delete', and 'Add Venues'.

Figure 4: Database Interface

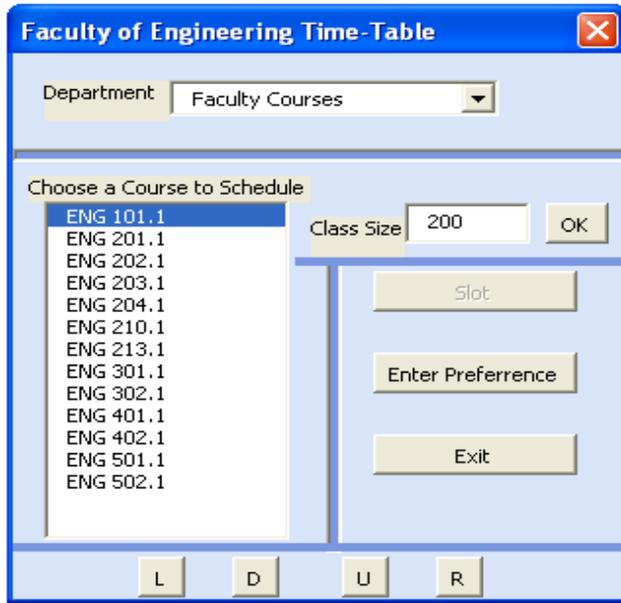


Figure 5: LTSS Interface

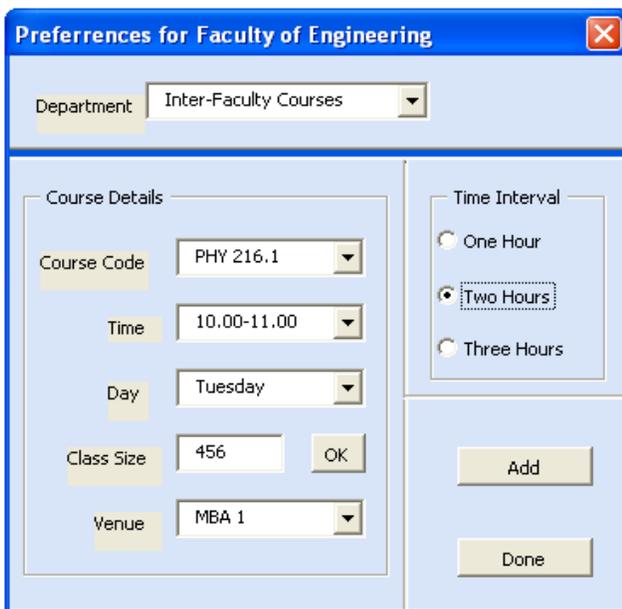


Figure 6: Preference Interface

Data set from the Faculty of Engineering University of Port Harcourt was used for scheduling the Timetable. With regard to the performance of the software at run-time, LTSS has been tested and has yielded most satisfactory results, not only at respecting the user preferences that had been entered but also

at reaching an optimum solution to the specific timetabling problem. Figure 7 shows an example timetable generated for 2006/2007 academic session.

The constraint satisfaction programming (CSP) approach adopted for the development of LTSS is a programming framework that fits perfectly with the timetabling problem faced by the Faculty of Engineering University of Port Harcourt, as well as with any other timetabling problems. The software is quite flexible both from the implementation and the user points of view. The flexibility in the implementation, which is actually based on the declarative style of programming supported by CSP, offers the possibility to easily add more constraints, which might be very different in nature from the existing once. All the information that describes the data for the specific problem is user defined (or may be taken from an existing database).

UNIVERSITY OF PORTHARCOURT																				
FACULTY OF ENGINEERING																				
FIRST SEMESTER TIME TABLE FOR 2006/2007 SESSION																				
DAY	8.00-9.00		9.00-10.00		10.00-11.00		11.00-12.00		12.00-1.00		1.00-2.00		2.00-3.00		3.00-4.00		4.00-5.00		5.00-6.00	
	C-CODE	VENUE	C-CODE	VENUE	C-CODE	VENUE	C-CODE	VENUE	C-CODE	VENUE	C-CODE	VENUE	C-CODE	VENUE	C-CODE	VENUE	C-CODE	VENUE	C-CODE	VENUE
	GES 100.1	PS HALL	GES 100.1	PS HALL	ENG 213.1	ULCH 1	ENG 101.1	EDS	ENG 401.1	ULCH 1	ENG 401.1	ULCH 1	CHE 313.1	ULCH 1	CHE 413.1	ULCH 1	ENG 502.1	LH II	ENG 203.1	LH II
M	CHE 511.1	ULCH 1	ENG 202.1	ETF	ENG 213.1	EDS	ENG 101.1	ETF	ENG 401.1	EDS	ENG 401.1	EDS	MEG 307.1	EDS	MEG 405.1	EDS	ENG 502.1	EDS	ENG 203.1	EDS
O	MEG 503.1	EDS	ENG 202.1	EDS	CHE 311.1	RM B3	CHE 513.1	ULCH 1	MEG 551.1	MEG LAB	CEG 381.1	CEG LAB	CEG 446.1	HYDR	EEE 302.1	RM B2	CEG 461.1	PLE	CHE 515.1	ULCH 1
N	CEG 562.1	RM A5	CEG 446.1	RM A5	CEG 323.1	RM B4	EEE 401.1	RM B2	CEG 547.1	RM A4	PNG 301.1	PTDF-N	EEE 401.1	RM B3	PNG 501.1	PTDF-N	EEE 304.1	ULCH 1	EEE 402.1	RM B1
	EEE 404.1	RM B3	EEE 501.1	ULCH 1	PNG 301.1	PTDF-A	EVE 401.1	RM B3	PNG 302.1	PTDF-W	CHE 315.1	RM B3	PNG 303.1	PTDF-LAB	CEG 461.1	PLE	CHE 315.1	RM A4	PNG 501.1	PTDF-A
	PNG 502.1	PTDF-A	CHE 415.1	RM B3	EEE 304.1	RM B1	PNG 502.1	PTDF-W	CHE 517.1	RM B3	EEE 506.1	RM B1	GNG 501.1	PTDF-N			PNG 403.1	PTDF-W	GNG 502.1	PTDF-N
	MTH 110.1	MBA 1	GNG 402.1	ULCH 1	MEG 307.1	EDS	CHM 130.1	MBA 1	ENG 101.1	EDS	ENG 301.1	ULCH 1	ENG 201.1	LH II	FSB 101.1	MBS 13	EEE 303.1	EDS	CHE 313.1	RM B3
T	CHE 421.1	CHE LAB	MEG 307.1	EDS	CEG 443.1	HYDR	ENG 202.1	ETF	ENG 101.1	ULCH 1	ENG 301.1	EDS	ENG 201.1	EDS	MEG 309.1	ULCH 1	CEG 514.1	HYDR	MEG 407.1	ULCH 1
U	MEG 451.1	MEG LAB	CEG 548.1	HYDR	EEE 305.1	EEE LAB	ENG 202.1	EDS	EVE 501.1	HYDR	CEG 444.1	RM B1	MEG 507.1	ULCH 1	EEE 303.1	EDS	EVE 502.1	PLE	CEG 321.1	RM B4
E	EEE 402.1	EDS	EEE 501.1	RM A5	PNG 302.1	ULCH 1	CEG 443.1	RM A4	EEE 405.1	RM A5	EEE 502.1	RM A5	EEE 406.1	EEE LAB	PNG 303.1	PTDF-LAB	GNG 401.1	ULCH 1	EEE 303.1	RM A4
	GNG 402.1	ULCH 1	PNG 405.1	PTDF-LAB	CHE 317.1	RM B3	EEE 503.1	RM A5	CHE 417.1	RM B3	CHE 515.1	RM B3	CHE 417.1	RM B3	CHE 517.1	RM B3	CHE 317.1	RM B3	PNG 503.1	PTDF-N
	PNG 503.1	PTDF-A	CHE 517.1	RM B3			PNG 402.1	ULCH 1	MEG 403.1	LH II	MEG 561.1	LH II	PNG 504.1	PTDF-N			MEG 507.1	LH II		
	GES 102.1	PS HALL	MEG 311.1	ULCH 1	ENG 501.1	ULCH 1	ENG 201.1	MBA 1	MTH 120.1	MBA 2	MTH 120.1	MBA 2	CHE 211.1	ULCH 1						
W	ENG 213.1	LH II	ENG 401.1	LH II	ENG 501.1	EDS	ENG 201.1	EDS	CHE 421.1	CHE LAB	MEG 303.1	ULCH 1	MEG 403.1	EDS						
E	ENG 213.1	EDS	ENG 401.1	EDS	CEG 321.1	PLE	CHE 411.1	RM B1	MEG 309.1	ULCH 1	CEG 534.1	HYDR	EEE 406.1	EEE LAB	SPORT		SPORT		SPORT	
D	MEG 311.1	ULCH 1	CEG 321.1	RM A4			MEG 401.1	ULCH 1	CEG 351.1	RM B4	EEE 403.1	EDS	CEG 547.1	HYDR						
	CEG 413.1	RM A4	EVE 501.1	RM B4			CEG 444.1	RM A4	EEE 404.1	EDS	GNG 401.1	PTDF-A	GNG 501.1	PTDF-A						
	GNG 402.1	PTDF-A	GNG 502.1	PTDF-A	GNG 403.1	PTDF-LAB	GNG 503.1	PTDF-A	PNG 401.1	PTDF-W	PNG 501.1	PTDF-A/N	PNG 401.1	PTDF-A/N						
	ENG 203.1	ULCH 1	ENG 203.1	ULCH 1	PHY 216.1	MBA 1	PHY 216.1	MBA 1	ENG 502.1	ULCH 1	MEG 301.1	EDS	MEG 301.1	EDS	MEG 401.1	EDS	MEG 305.1	EDS	MEG 305.1	EDS
T	ENG 203.1	EDS	ENG 203.1	EDS	ENG 301.1	ETF	ENG 301.1	ETF	ENG 502.1	EDS	CEG 332.1	PLE	CEG 413.1	PLE	CEG 351.1	PLE	CEG 483.1	CEG LAB	CEG 352.1	PLE
H	MEG 451.1	MEG LAB	CEG 534.1	HYDR	ENG 301.1	EDS	ENG 301.1	EDS	CEG 352.1	HYDR	EEE 305.1	EEE LAB	EEE 403.1	RM B4	EEE 501.1	RM B4	EEE 404.1	RM B4	EEE 502.1	RM B4
U	CEG 548.1	HYDR	EEE 405.1	RM B4	CEG 514.1	RM B3	CEG 461.1	RM B4	EEE 406.1	EEE LAB	EVE 401.1	HYDR	EVE 504.1	HYDR	GNG 401.1	PTDF-A/N	PNG 301.1	PTDF-A/N	EVE 501.1	RM A5
	EEE 503.1	RM B4	EVE 502.1	PLE	EEE 504.1	RM B4	PNG 510.1	PTDF-A/N	EVE 401.1	RM B4	GNG 403.1	PTDF-LAB	PNG 302.1	PTDF-A/N	PNG 405.1	PTDF-LAB			PNG 401.1	PTDF-A/N
	PNG 402.1	PTDF-A/N	PNG 510.1	PTDF-W	PNG 403.1	PTDF-A/N			PNG 404.1	PTDF-A/N	PNG 510.1	PTDF-N								
	ENG 201.1	LH II	ENG 302.1	ULCH 1	PHY 101.1	MBA 2	PHY 101.1	MBA 2	ENG 204.1	ULCH 1	ENG 204.1	ULCH 1	CHM 250.1	MBA 2	CHM 250.1	MBA 2	ENG 402.1	ULCH 1	ENG 402.1	ULCH 1
F	ENG 201.1	EDS	ENG 302.1	EDS	ENG 210.1	ETF	ENG 210.1	ETF	ENG 204.1	EDS	ENG 204.1	EDS	CHE 421.1	CHE LAB	ENG 501.1	LH II	ENG 402.1	EDS	ENG 402.1	EDS
R	CHE 511.1	ULCH 1	CEG 443.1	PLE	ENG 210.1	EDS	ENG 210.1	EDS	CEG 332.1	RM A4	CEG 445.1	PLE	MEG 305.1	ULCH 1	ENG 501.1	EDS	CEG 562.1	HYDR	CHE 513.1	RM A4
I	CEG 445.1	RM A1	CHE 55X.1	RM B3	MEG 503.1	ULCH 1	CHE 411.1	LH II	EEE 305.1	EEE LAB	EVE 502.1	HYDR	CEG 483.1	CEG LAB	EEE 304.1	ULCH 1	CHE 317.1	RM A4	CEG 591.1	HYDR
	EVE 503.1	PLE	PNG 503.1	PTDF-N	CEG 591.1	RM B4	MEG 505.1	ULCH 1	EVE 503.1	RM A5	PNG 515.1	PTDF-N	EEE 302.1	EDS			MEG 5XX.1	LH II	EEE 502.1	RM A2
			MEG 5XX.1	LH II	CHE 55X.1	RM A4			CHE 55X.1	LH II	MEG 5XX.1	LH II								
	CHE 311.1	ULCH 1	CHE 411.1	ULCH 1	CHE 315.1	RM B1	ENG 302.1	PS HALL	ENG 210.1	PS HALL	CHE 313.1	RM A1	MEG 303.1	EDS	MEG 405.1	EDS	CHE 311.1	ULCH 1	MEG 311.1	EDS
S	MEG 407.1	EDS	MEG 505.1	EDS	MEG 251.1	EDS	ENG 302.1	EDS	ENG 210.1	EDS	MEG 453.1	MEG LAB	EEE 302.1	RM A4	EEE 401.1	RM A1	MEG 507.1	EDS	EEE 301.1	ULCH 1
A	EEE 405.1	RM A4	CEG 323.1	RM B1	CEG 562.1	RM A1	CHE 413.1	ULCH 1	CHE 513.1	ULCH 1	EEE 301.1	EDS	CHE 415.1	ULCH 1	GNG 501.1	PTDF-W	EEE 301.1	RM A1	CHE 515.1	RM A2
T	GNG 502.1	PTDF-A	EEE 503.1	RM A2	PNG 504.1	PTDF-A/N	MEG 407.1	LH II	MEG 551.1	MEG LAB	PNG 403.1	ULCH 1	PNG 505.1	PTDF-N	CHE 417.1	ULCH 1	PNG 402.1	PTDF-A	PNG 515.1	PTDF-A
	PNG 404.1	PTDF-W	PNG 515.1	PTDF-A/N	EEE 504.1	ULCH 1			EEE 505.1	RM B1										
							EEE 505.1	RM B1												

Figure 7: An example result generated with the software

CONCLUSIONS

This paper has examined the timetable scheduling problem and a specific system called LTSS, which constructs optimum timetables for university courses, is presented. The timetabling problem being a constraint satisfaction one is mapped naturally to the constraints provided by the faculty of Engineering. moreover, the modeling of the problem under consideration profits a lot from the declarative style of programming which is supported by Excel Visual basic for application

The performance of LTSS is quite satisfactory, considering that it is a program that has to run once or twice a year for the construction of the timetable of an educational organization. Some improvements which are currently under development will certainly enhance the system's functionality. On a positive final note, there would appear to be almost no training issues to be addressed.

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The Role of Videos in Delivering Meaning of L2 Metaphors to Saudi EFL Learners

Reem Alotaibi

Department of English Language and Literature, Faculty of Arts, King Saud University, Riyadh, Saudi Arabia

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Abstract- This study investigates Saudi EFL learners' L2 metaphoric language knowledge through a multiple-choice pre-test questionnaire. This questionnaire was re-administered after participants watched the videos containing the same metaphors. Results suggested that learners lack figurative language knowledge, yet when these were exposed in videos a significant improvement was seen through the post-test questionnaire. Results were analyzed in terms of literal and non-literal choices demonstrated in the questionnaire. Also, a contrastive model of six types of metaphors developed by Charteris-Black (2002) was considered in analyzing the poor performances drawn by participants.

Index Terms- EFL learners, Figurative language, Metaphors

I. INTRODUCTION

Metaphors are widely used in everyday speech. They are defined as "conceptual operations reflected in human language that enable speakers to structure and construe abstract areas of knowledge and experience in more concrete experiential terms" (Hurford, Heasley, and Smith, 2007, p. 331). It is important that EFL learners are capable of comprehending and using metaphors in their daily communications. A study by Zibin (2016) revealed that Jordanian EFL learners are not capable of producing English metaphorical expressions which was seen through the participant's low results of answering a completion task of metaphors. The lack of producing metaphorical expressions or even understanding them is due to the shortage of continuous exposure to the metaphorical expressions in real-life English (Zibin, 2016).

The present study attempts to examine the role of videos as an exposure in delivering meaning of metaphors. It aims to discover the extent Saudi EFL learners can understand metaphorical expressions both before and after they are shown video clips of people using metaphors in everyday situations. An experimental design of a pre- and post-test will be used as the indicator of the role of videos in delivering the correct meaning of metaphors.

The study follows the general theoretical framework of Conceptual Metaphor Theory that was first introduced in 1980 by Lakoff and Johnson. The theory proposes that understanding can be established through linking one idea to another idea. Thus, the correlation between the understandings of metaphors via visual demonstrations of such metaphors in videos could lead to the reference of using videos in language comprehension.

II. REVIEW OF LITERATURE

Zibin (2016)

Zibin (2016) sheds light on the production of metaphors and metonymies by Jordanian EFL learners. She aimed to discover to what extent Jordanian EFL learners have the ability to produce figurative devices such as metaphors and metonymies in English. Another focus drawn by the author was to discover the influence of first language figurative knowledge on the participants' production of English metaphorical and metonymical expressions.

Throughout the paper, Zibin adopted a contrastive model to compare and contrast figurative devices in English and Jordanian Arabic. This contrastive model was developed by Charteris-Black (2002) investigated figurative expressions in English and Malay in terms of the similarities and differences between the two languages. The model consisted of six types of figurative units that was based on an earlier model designed by Deignan et al. (1997). These six types of figurative units by Charteris-Black were proposed depending on whether there is a correspondence between the linguistic expression and the conceptual basis in the two languages. It also examines whether the linguistic expressions and conceptual bases exhibit culture-specific (opaque) or universal (transparent) characteristics.

Figurative units are divided into the following:

- 1) Equivalent conceptual basis and equivalent linguistic form.
- 2) Equivalent conceptual basis and similar linguistic form.
- 3) Completely different conceptual basis but similar linguistic forms.
- 4) Similar conceptual basis but completely different linguistic form.
- 5) Completely different conceptual bases and completely different linguistic expressions but the metaphorical expressions may be transparent.
- 6) Completely different conceptual basis and completely different linguistic expressions with an opaque metaphorical expressions.

One hundred advanced learners studying English Language and Literature at the University of Jordan participated in this study. Their mean age was 22 years, and they were in the final stage of their BA; having completed 80 to 90 credit hours of advanced English courses such as poetry, drama, and syntax. The author Zibin (2016) referred to McGraw-Hill's American Idioms

Dictionary (2007) for her data collection to extract metaphors and metonymies in English. She also used A Comprehensive Dictionary of English Idioms: English-Arabic (1997) to collect these devices in Arabic. To ensure the validity of the results, the author checked the frequency of the English figurative units in The Corpus of Contemporary American English to ensure that they are used in contemporary speech.

As for the instrument of the study, a 24-item cued completion test containing contexts was given to participants: four figurative expressions for each type of the six figurative units by Charteris-Black. The participants were given three clues that assisted them in providing the correct answers of the required figurative expression. One indicated an idea about the meaning of the expression they should use. The second clue emphasized a keyword from the metaphorical expression in question. The last clue indicated the number of words they should use. Six tables were presented to show the percentage of the correct responses on each test item for the six types of figurative units.

In addition, an earlier study conducted by Zibin (2016) measured the participants' receptive knowledge of the metaphorical/metonymical expressions using a multiple-choice test. However, according to Zibin's recent (2016) study, the aim was to investigate the participants' production knowledge of these expressions using a completion test. Both Zibin (2016) used the same figurative devices and tested the same participants. Zibin wanted to compare the participants' results on both tests and measure their abilities to comprehend and produce English metaphorical/metonymical expression.

Zibin (2016) showed that the participants' scores were poor in general yet their general capacity to produce metaphorical/metonymical expressions is mainly due to their L1 conceptual and linguistic knowledge. In comparing Multiple-choice test and completion test results, Zibin found that the participants' overall performance on the multiple-choice test (71%) was much higher than their performance on the completion test (22%). This suggests that the participants' ability to recognize figurative units exceeds their ability to produce them even though they were given three clues to help them.

The author summed up that there are factors that need to be satisfied to enable EFL learners to produce English figurative devices correctly. They are as following: knowledge of the conceptual bases involved, a good command of English collocational knowledge, and familiarity with the concept of partial synonymy, and continuous exposure to the metaphorical/metonymical expressions in real-life English. She thus suggested some pedagogical implications that may help EFL learners to acquire L2 figurative expressions. One of the suggestions offered to those teaching English as a second language, is that they should expose students to real world examples of metaphors being used by native speakers of L2 (English) such as TV shows and movies (Farah and Bin Moussa, 2007).

Zibin's (2016) studies found that EFL students' ability to use and understand metaphorical expressions is limited. The author outlined the factors that need to be satisfied to enable EFL learners to produce English figurative devices correctly. The primary recommendation is continuous exposure to the figurative expressions in real-life scenarios by native English speakers.

Therefore, a study of the effectiveness of exposure in using video clips of metaphorical expressions (videos are both time effective and easily accessible) for delivering correct meaning of metaphors is a relevant and dynamic response to Zibin's (2016) both studies. This proposed research will examine participants knowledge of metaphors before they are exposed to them on videos and afterwards. Zibin's studies relies heavily on the participants using background knowledge, likely from their own semantic system to infer meaning. This paper, however, investigates the impact of video exposure in giving Saudi EFL learners the correct meaning of metaphors. This should improve their ability in using them in everyday life.

Related studies on increasing EFL learners' awareness of metaphors

Different methods were conducted to raise EFL learners' awareness of figurative expressions, for example metaphors. These attempts noticed the issue of EFL learners' lack of non-literal meaning production or comprehension. This resulted in a problematic issue that warrants an investigation by linguistic researchers.

In addition, varied exposure methods could be taken as ways to improve EFL learners' awareness of figurative expressions. However, non-related studies considered video exposure as a way in raising EFL learners' metaphorical expressions. Instead different cognitive-oriented methods were adopted in studies to show an increase of EFL learners acquiring metaphors.

EFL learners' cognitive styles may play a role in developing their competence of metaphors. The authors Chen, Lin, and Lin (2014) adopted two cognitive-oriented methods, these are instruction adopting conceptual metaphors (CM) and instruction involving metaphoric mappings (MM). They wanted to determine which one of the two instruction methods (CM or MM) would be effective for learners with different cognitive styles (field-dependent cognitive style and field-independent cognitive style) in learning metaphors. Tests of determining learners' cognitive style were taken place and thus they were divided into two groups (FD and FI). The participants were learning English as a second language and were native speakers of Chinese.

Results revealed that learners of field-dependent cognitive style advanced from CM instruction more than MM, where learners of field-independent cognitive style progress better with the MM instruction method. However, the study concludes its discussion saying that MM instruction is recommended to EFL learners in developing awareness of figurative devices. The MM instruction helped learners in providing logical clues that resulted in them extracting and producing metaphoric expressions as required in the study test (Chin, Lin, and Lin, 2014).

Moreover, researchers on idioms shed light on metaphors as a way to learn idiomatic expressions. Idioms are referred to as 'multi-word phrases whose overall meaning are idiosyncratic and largely unpredictable, reflecting speaker meaning that are not derivable by combining the literal sense of the individual words in each phrase according to the regular semantic rules of the language' (Hurford, Heasley, and Smith, 2007, p.328).

Previous claims suggested that idioms can be learnt via conceptual metaphors through the associations of source and

target terms. However, cultural differences of both domains were not taken into consideration and thus failed to accomplish the goal (Chen and Lai, 2013). Therefore, these two authors attempt to bridge this gap by providing the suggestion of metaphoric mappings in learning idioms. This was done by giving EFL participants (Chinese native speakers) a text and required them to extract the idiomatic expressions found there. They were then asked to think about general themes of metaphors for the extracted idiomatic expressions and start to draw linking diagrams between them, in other words they were the metaphoric mappings. This cognitive-oriented method showed that participants' awareness of using idiomatic expressions, as seen in their written essays, increased within the use of creative analogies. The most used expressions by participants are those whose conceptual metaphors are found both in L2 and L1 compared to expressions having different conceptual metaphors.

Literal and non-literal meaning

The relationship between literal and non-literal meaning is considered to be an issue when analyzing metaphors. In the past, non-literal meaning was not given great attention in the field of semantics. This was likely due to the fact that both literal and non-literal meanings are similar in the function of delivering meaning. Another reason is that, non-literal meaning is restricted to specific occasions and subjects, so its use would be limited. However, this has changed in the case of metaphors as they are widely used in everyday language, thus the focus of non-literal meaning turned to be of concern by semanticists (Hurford, Hearsley, and Smith, 2007, p. 328).

Initially, non-literal meaning was of consideration because of the dominant use of metaphors that are considered as figurative language. However, recent studies suggested that the relationship between literal and non-literal meaning is no longer distinguished differently. This is due to the occurrence of "conventional metaphoric language" in everyday speech which has made the distinction between the two difficult (Coulson and Oakley, 2005). Therefore, the correlation between literal and non-literal meaning could be one of the issues EFL learners could face in acquiring metaphorical expressions.

III. STATEMENT OF THE PROBLEM

Many EFL learners face difficulties in producing or even understanding metaphorical expressions though it has become an important aspect of modern communication. They lack the knowledge of knowing the meaning of these metaphors and are therefore restricted from the frequent use of metaphors. Therefore, this current study aims to investigate the effectiveness of video exposure of metaphors in delivering the correct meaning to Saudi EFL learners.

IV. RESEARCH QUESTIONS

This study aims to provide answers to the following questions:

1. To what extent do Saudi EFL learners understand the meaning of metaphors in English before they are exposed to them on videos?
2. Does the use of videos have a role in delivering the correct meaning of metaphors in English?

V. PROPOSED METHODOLOGY

Participants

The participants were selected from EFL adult learners (approximately 20 students) who study 'General English' in the preparatory program at King Saud University/ first semester of 2017. They were studying English at Saudi public schools from grade 6 (13 years old), although their English curriculum was limited. Therefore, these participants have had a limited exposure to the English language. Participants' age ranges from 19 to 20.

Research Tool

The main research apparatus will be an experimental design of a pre-test and a post-test, both consisting of 10 multiple choice questions. These questions will be coupled with videos of metaphorical expressions being used in contemporary media (Movies, T.V. Shows, and News etc.). Ten short video clips, no longer than 2 minutes each, will be presented for students before giving the post-test.

Procedure

Participants were asked to answer pre-tests of 10 multiple choice questions of metaphorical expressions within 5 minutes. After answering the pre-test questionnaire, the researcher presented video clips having these metaphorical expressions in them. The post-test was given afterwards for the same participants to answer within 5 minutes. The tests were assessed by analyzing the correct answers of the participants before and after videos exposure.

VI. RESULTS & ANALYSIS

Before Exposure

The students were asked to select the correct meaning of the statements in the table below to assess their understanding of metaphors. The word "metaphors" was not stated in the questionnaire, so the researcher could assess student's ability in recognizing them. The answer varied in meaning, these were either literal or figurative. The results conclusively showed an inability of the participants' knowledge to understand the metaphorical expressions.

The participants' results were generally poor. On average, 2/10 of the questions administered in the questionnaire were answered correctly by the participants. Most of the 20 respondents decided to select literal meaning which shows their inability in recognizing hidden meanings. The correct response to all of the statements provided was to select a non-literal meaning.

Table I: Results prior exposure to the videos

Metaphorical expression	Literal Option	Non-literal Option	Correct answers (Selected nonliteral meaning)	Incorrect answers (Selected literal meaning)
1. 'Diamond in the rough'	A person who is secretly rich	A person having hidden qualities	4	16
2. 'When it comes to compliments women are ravenous blood sucking monsters'	Women are monsters	Women like compliments so much	5	15
3. 'Life is your restaurant'	You can have a lot of food	You can have whatever you want in life	9	11
4. 'We are a time bomb'	We are strong together	We are about to turn on each other	8	12
5. 'You are a firework'	You use fire	You have power	13	7
6. 'Life is a gift'	You receive gifts in life	Life is an opportunity	8	12
7. 'You are a mad dog'	You are a mad person	You are aggressive	6	14
8. 'She is a saint'	She works in a church	She is a good person	7	13
9. 'Taking the bull by the horns'	He knows how to ride a bull	He is able to manage life	5	15
10. 'This house is a prison'	A house where criminals are	A house that has not got any fun activities	16	4

It is clear that respondents lack the ability of recognizing metaphors as the number of incorrect responses exceeds that of correct answers. The figurative expression of number one shows a gap as numbers of correct and incorrect answers are significant; 4 correct and 16 incorrect. Another example is shown in the second metaphorical expression (5 and 15 respectively), similarly with statement nine (5 and 15 respectively).

In addition, though the responses of correct and incorrect answers were close in numbers with other metaphor examples, they identify respondents' low perception of metaphors. This is seen through the responses in the metaphor examples of number three (9 and 11), and also of number four (8 and 12). However, the metaphor examples of number five and ten were answered

correctly by the majority of participants. The responses were of 13 and 7 for number five, and 16 and 4 for number ten.

After Exposure

After collecting the pre-test questionnaires, the researcher started to expose videos to Saudi EFL participants before giving them the post-test. They were asked to answer the questions in relation to what they have been watching on videos.

The answers show that respondents benefitted vastly with visual demonstrations in understanding metaphors, the average number of correct answers increased to 6/10. Some metaphor examples remained to be difficult to understand for participants as results suggested. They were number seven, eight, and nine.

Table II: Results after exposure to the videos

Metaphorical expression	Literal	Non-literal	Correct answers (Selected nonliteral meaning)	Incorrect answers (Selected literal meaning)
1. 'Diamond in the rough'	A person who is secretly rich	A person having hidden qualities	11	9
2. 'When it comes to complements women are ravenous blood sucking monsters'	Women are monsters	Women like compliments so much	12	8
3. 'Life is your restaurant'	You can have a lot of food	You can have whatever you want in life	16	4
4. 'We are a time bomb'	We are strong together	We are about to turn on each other	17	3
5. 'You are a firework'	You use fire	You have power	16	4
6. 'Life is a gift'	You receive gifts in life	Life is an opportunity	11	9
7. 'You are a mad dog'	You are a mad person	You are aggressive	9	11
8. 'She is a saint'	She works in a church	She is a good person	8	12
9. 'Taking the bull by the horns'	He knows how to ride a bull	He is able to manage life	6	14
10. 'This house is a prison'	A house where criminals are	A house that has not got any fun activities	18	2

Metaphor 1 shows a significant increase in the number of correct answers (11 correct and 9 incorrect) as opposed to the pre-video questionnaire (4 correct and 16 incorrect).

Additionally, metaphor 2 implies an increase in choosing non-literal meaning than literal (12 and 8 compared to 5 and 15).

The highest number of correct answers were seen through metaphors five and ten, the ones that received a positive feedback through pre-test results. They were of (13 and 7) and (16 and 4) in the pre-test questionnaire but improved to (16 and 4) and (18 and 2).

Metaphors seven, eight, and nine received the lowest scores. Though they showed improvement in the number of

correct answers, yet the majority of participants did not see the hidden meaning and thus selected literal meaning option. Metaphor 7 improved slightly from 6 correct to 9 correct answers. As for metaphor 8, the improvement was marginal, from 7 correct and 13 incorrect to 8 and 12 respectively. Lastly metaphor 9 scored 5 and 15 and improved in the post-test questionnaire to 6 and 14.

VII. DISCUSSION

Results Prior Exposure

This study was restricted in the number of participants (20 in total) which would be considered inadequate to form any

concrete basis. Also, the participants were mostly from the same age demographic. They therefore had a disposition and an intimate understanding of the videos they were shown. This cultural awareness would enable them to find context clues to aid them in understanding the metaphors. This study did not take into consideration the impact that the same videos would have on mature EFL learners, who did not have the background knowledge of the culture of the language to infer meaning from such videos.

Nonetheless, the results were positive and reinforce the idea that videos aid EFL students in understanding metaphors, metaphors an essential component when communicating in contemporary English.

Most participants showed poor performance in the pre-test questionnaire in understanding the correct meaning of metaphors. Metaphor examples one, two and nine had the lowest number of correct answers. These were of type three metaphors as defined by Charteris-Black contrastive metaphorical model, this meant that they were of different conceptual basis but similar linguistic forms in English and Arabic. Zibin (2016) identified this issue when she assessed participants' receptive knowledge of metaphors and noticed that the lowest scores were of type three due to conceptual basis difference.

Regarding the metaphorical example of number two, the language used in this metaphor played a role in failing to deliver the correct meaning of the figurative expression. Words such as 'ravenous' and 'sucking' were not completely understood by the participants who had a limited knowledge of English due to their short experience of learning the English language in Saudi public schools.

Moreover, the two metaphorical examples that received significant positive feedback in both periods of pre-and post-tests were numbers five and ten. These two metaphors are considered to be of type two. This is when the metaphor has equivalent conceptual basis and similar a linguistic form in English and Arabic. Actually, these two metaphors are widely used in Saudi Arabia and thus participants were at ease in finding the equivalent in their native language. This is in agreement with Chen and Lai (2013), they found that most of participants' writing of idiomatic expressions, based on the cognitive method of metaphor mapping, were due to whose conceptual metaphors are found both in L1 and L2.

Metaphor 8 scored a low response due to cultural differences. The word 'saint' would be an easy word to know if students had a background knowledge of the beliefs and principles practiced in the foreign language society. Participants thought that selecting the literal meaning of a woman being in a church would be correct because of relation to cultural life. Therefore, the participants failed to uncover the hidden meaning of the metaphor. This figurative expression is of type six that has different conceptual basis and different linguistic expression. In the study of Zibin (2016) this particular type received low scores (52 %). Both Saudi and Jordanian cultures are similar in many ways emphasizing the agreement of this current study's results with Zibin's (2016).

Regarding metaphor 3, the majority selected literal meaning, yet they scored a high rate of correct answers compared to the others except for examples 5 and 10. Participants linked the words 'restaurant' and 'life' to the idea that everything you

wish is available. They likely avoided the second option because of the absence of the word 'life' illustrated in the example itself. Leading them to choose the other option where the words 'life' and 'restaurant' were both found.

The same happened with metaphor number 7 but resulted in an opposite outcome, respondents preferred to select the literal option because the word 'mad' was found both in the metaphor and the option.

Furthermore, metaphors number 4 and 6 scored the same number of total correct answers of 8. The word 'bomb' implies power, therefore leading students to pick the literal meaning of 'strong'. As for metaphor 6, the word 'gift' was stated both in the metaphor and the option. Therefore, students selected the literal meaning rather than the non-literal.

Results after Exposure

Post-test results showed an increase in the number of correct answers due to exposure. The more clues seen in the video exposure the more improvement of getting the meaning of metaphors by participants.

Metaphors 5 and 10, received positive feedback from the beginning and increased more during the post-test questionnaire, the video exposure of these two metaphors provided enough clues to EFL learners to get the meaning of the expressions.

As for number five, the video indicates a person who shoots fireworks towards the face of an enemy with courage. This made the results reach a number of 16 compared to 13 in the pretest questionnaire. As for metaphor 10, the scene showed that a father punished his brothers by not allowing them to watch TV for a week, consequently one of the boys complains saying 'this house is a prison'. Participants received the meaning by linking TV to be of the fun activities stated in non-literal meaning option. The score of this metaphor jumped to 18.

Furthermore, Metaphor 1 received 4 correct answers in the pre-test period, after exposure it improved to be of 11. This was a significant improvement. During the video, the speaker repeated their desire to find one unique person, in a longing and lustful tone prior to uttering the metaphor.

Furthermore, visual demonstrations were helpful also in the case of example number two. During the exposure of this metaphor, the expression "life is your restaurant" was said by a blue 'Jinni' who is capable of granting wishes to a poor boy, whilst presenting him with many different bounties. Thereafter participant's scores increased to 16 from 9. The video clip of this metaphor is from a well-known film cartoon; thus, students knew in advance the role of this 'Jinni' in the film. The concept of a 'Jinni' is common in many cultures.

Metaphor number 6 received 11 correct answers pre-exposure, it improved to 14 correct answers only. This is due to the shortage of clues seen in the video. The speaker uttered this figurative expression followed by a talk of how you should get use of life. Participants may have linked the idea that receiving gifts is one way to enjoy life resulted in a slight increase of the correct responses.

Interestingly, metaphor number 4 contained an implicit negation. The speaker in the video clip explicitly said "we are not a team" followed right forward by the metaphor "we are a time bomb". This explained the increase from 8 to 17 correct

answers. Negation was beneficial for participants in determining the correct answer.

As for metaphor 2, the speaker in the video mentioned the metaphor whilst also repeating the word 'more' this affirms the correct explanation of 'when it comes to compliments women are ravenous blood sucking monsters'. This raised the score of non-literal meaning answer into 12 from 5.

Metaphor numbers 7, 8 and 9 scored the lowest scores. The video exposure of these metaphors did not indicate enough clues to deliver the correct meaning of the expressions. However, slight improvement can be seen through results.

As for metaphor 7, the addressee showed an annoyed reaction and threatened the speaker not to call him that again 'you are a mad dog'. The score therefore increased two points only as evidences were barely seen in the video.

The video coupled with metaphor 8 showed a discussion between two individuals. One individual spoke badly about a woman called Dorothey, and the other speaker showed a disagreement and uttered 'she is a saint'. Participants faced a difficulty in understanding the word 'saint' and therefore thought it to be of cultural context i.e. 'she works in a church'. This explained the very slight improvement in results.

In addition, metaphor 9 showed also a weak increase. The video exposure of the metaphor contained a picture of the speaker who uttered the metaphor riding a bull. However, the context of the video was slightly vague as the video contained a bull and therefore confused the participants who selected the literal meaning.

VIII. CONCLUSION

This study was conducted to explore the extent of Saudi EFL learners' ability in understanding metaphors before they are exposed to them in videos. It also aimed to discover the role of visual exposure in delivering the correct meaning of metaphors to EFL learners. This attempt took place due to the evident disability seen in EFL learners with respect to producing and comprehending metaphorical expressions. Results suggested that Saudi EFL learners, through the pre-test questionnaire, showed a poor performance in understating metaphors. This is due to their

selection of literal meaning rather than non-literal. Most of the results after video exposure increased significantly implying that videos play an essential role in delivering the correct understanding of metaphors.

One of the major limitations of this study was the limited number of participants. Using a small sample of only 20 participants is insufficient to form a solid pattern. Also, most of the participants were young adult learners. This restricted demographic may have a greater understanding of the video's that were provided, most of which stemmed from popular western culture. How these videos would shape the understanding of mature EFL students is yet to be seen.

Metaphors are of important use that they become to be of literal meaning in everyday speech (Coulson and Oakley, 2005). Therefore, this area is essential for further investigation in the Saudi context with participants of a higher knowledge of the English language and more diverse backgrounds.

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AUTHORS

First Author – Reem Alotaibi, Department of English Language and Literature, Faculty of Arts, King Saud University, Riyadh, Saudi Arabia

Status of major coastal fishing activities in the Mekong Delta, Vietnam

Nguyen Thanh Long, Mai Viet Van, Dang Thi Phuong, Naoki Tojo and Tran Duc Dinh

College of Aquaculture and Fisheries, Can Tho University, Can Tho City, Viet Nam

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Abstract- A study on the major fisheries was conducted from August 2017 to April 2018 in coastal provinces of the Mekong Delta, Vietnam. Results showed that the gillnets, trawl nets, and stow nets were the main fishing gears, accounted for the highest number of fishing boats and yields. All the fishing gears exploited for the whole year-round. The results also indicated that gillnets fishery is the largest scale (10.99 tons). The most effective fishing activity of gillnets fishy was the highest profit (298 million VND per year) ($p < 0.05$). However, the highest fishing yield (20.42 tons/year) was found in trawler but it had the lowest rate of return (0.45 times) and trash-fish portion accounted the highest ratio (38.4%). Although the stow nets had highest rate of return (1.41 times), but they were lowest yield (7.17 tons/year) and high portion of trash-fish. The high proportion of trash-fish may affect to fisheries resources. For the sustainable development of the fisheries in the Mekong Delta, the development and management of fisheries resources should be promoted, supporting fishermen to access low interest rates to invest in capture production, and training fishermen to use advanced fishing gear to increase their fishing efficiency.

Index Terms- challenges, fisheries, Mekong Delta, technique, economic, Vietnam

I. INTRODUCTION

The fisheries sector in Vietnam has developed strongly in recent years with the increase in production and product quality. In 2016, the total fisheries production was 6.8 million tons, of which the fishing production was 3.16 million tons, accounting for 46.4% of the total fisheries production, the export value of fisheries production was USD 7 billion. It contributes significantly to the GDP structure of the country (Ministry of Agriculture and Rural Development, 2016).

The Mekong Delta has a coastline of over 780 km, accounting for 23% of the national coastline, the exclusive economic zone of about 297,000 km². This area has a fish stock of over 2.5 million tons and the fisheries exploitation capacity is about 830,000 tons per year, which contributes to the fisheries

development (Ninh, 2006). In 2016, the fisheries production in the Mekong Delta reached 1.286 thousand tons, accounting for 40.6% of the total fisheries production of the country (GSO, 2017). Fisheries in the Mekong Delta are diverse in types of gear and sizes which are mainly trawl nets, gill nets and stow nets because of the huge number of vessels and the fisheries production (Long and Phuong, 2010).

However, fisheries sector in recent years have encountered a lot of challenges e.g. reduction of fisheries resources, increase in the input cost of many materials and fuels, thus affecting the fisheries activities. The aims of the study are to investigate the current status and challenges of the fish activities in the Mekong Delta order to propose appropriate solutions to enhance the effective of the fisheries sector.

II. METHODS

The study was conducted from August 2017 to April 2018 by interview fishermen in coastal provinces of the Mekong Delta such as Tien Giang, Ben Tre, Tra Vinh, Soc Trang, Bac Lieu, Ca Mau and Kien Giang. A total of 365 fishing households was face to face interviewed. Fishermen involved in gill nets (150 households), trawl nets (150 households) and stow nets (65 households) were randomly selected from the list provided by provincial agriculture and rural development.

The semi-structured questionnaire was piloted in five households in each group of fishing type including technical information e.g. gear structure, loading capacity of the vessel, labor force, fishing grounds, fishing seasons and fishing production. Cost information included fixed costs, variable costs and gross income were also collected for calculation of profit, rate of return. The advantages and disadvantages of the fisheries were also interviewed.

Results are expressed in descriptive statistics e.g. frequency of occurrence, mean value, and standard deviation. Statistical ANOVA (SPSS 16.0) was applied to compare the

differences in technical and financial indicators following with the Duncan test at a significance level of $\alpha = 5\%$.

III. RESULTS AND DISCUSSION

3.1 Technical aspects of fishing activities in the Mekong Delta

3.1.1 General information of fishing activities

Results from the interview of fishermen in coastal provinces in the Mekong Delta, Vietnam showed that fishing gears were mainly gill nets (50.8%), longlines (16.8%), trawl nets (16.5%). Other fishing gears accounted for 16.8% including stow nets, cage traps, powered-push nets.

This study focuses only on the fishing activities of the main fishing gears such as gill nets, trawl nets and stow nets as these accounted highest volume and yield (Table 1).

The average age of fishing captains ranged from 39.8 to 45.1 years (Table 2).

Captains had in-depth experience in fishing due to long time working in the sector. Commonly, young people living in the coastal area participated in the fishing activities quite early at the age from 15 to 18 years old. This is the reason why captain had in-depth experience in fishing activities. However, due to participating in fishing activities early, many of them encountered many difficulties in terms of education leading to low education level.

Most of captains received primary and secondary education; higher education was very limited; there were even a few illiterate captains (Table 2). Consequence, the modernization of offshore fishing remained obstacles because of the adaptation in new fishing technologies, using modern equipment e.g. radar, positioning machine and fish finder. The low level of education of the captains also hinders the implementation of fisheries resource protection policies as well as the legal policies related to fisheries. Therefore, to modernize the fishing industry, it is necessary to improve the education level of captains.

Table 1: Number of fishing vessels (boats) in coastal provinces in the Mekong Delta, Vietnam

Contents	Coastal provinces in the Mekong Delta							Total	Ratio (%)
	Tien Giang	Ben Tre	Tra Vinh	Soc Trang	Bac Lieu	Ca Mau	Kien Giang		
Trawl nets	31	1003	341	415	161	34	132	2117	16.5
Gill nets	40	439	228	200	432	1981	3203	6523	50.8
Longlines	18	63	31	12	7	404	1618	2153	16.8
Other fishing trades (stow nets, cage traps, powered-push nets,...)	140	190	362	237	6	178	943	2056	16.0
Total	229	1695	962	864	606	2597	5896	12849	100

Table 2: Information on the age and education level of the captains

Contents	Gill nets	Trawl nets	Stow nets
Age (years)	42.6±9.9	42.7±11.3	45.1±9.9
Education (%):			
- Illiteracy	12.00	6.67	1.54
- Primary education	52.67	58.67	50.77
- Secondary education	30.67	30.67	40.00
- High school education	4.67	4.00	7.69

Table 3: Labor force (persons) in fishing boats

Contents	Gill nets	Trawl nets	Stow nets
Total number of labors on fishing boats	5.35±2.51 ^c	3.55±1.25 ^b	2.65±1.61 ^a
The number of labors from family member	1.60±0.91 ^a	1.74±0.85 ^{ab}	1.91±0.97 ^b
The number of hired labors/employees	3.75±2.50 ^c	1.81±1.34 ^b	0.74±1.04 ^a

Values of the same row with different letters were significantly different ($p < 0.05$)

Table 4: Loading capacity and power of the fishing vessels

Contents	Gill nets	Trawl nets	Stow nets
Loading capacity (tons)	10.99±15.73 ^b	5.54±2.44 ^a	3.98±4.28 ^a
Power (HP)	39.87±20.48 ^b	37.54±16.24 ^{ab}	20.72±15.41 ^a

Values of the same row with different letters were significantly different ($p < 0.05$)

Table 5: Length and mesh size of fishing gears

Contents	Gill nets	Trawl nets	Stow nets
Length of the net (m)	8081±695	14.21±5.52	39.06±9.21
Width of the net (m)		0.92±0.08	11.21±2.54
Height of the net (m)	3.59±1.92	19.33±7.32	7.38±2.08
Smallest mesh size (mm)	61.35± 22.03	22.91±5.98	14.56±3.12

Results show that the labors in gill net fishing was higher than that of other occupations ($p < 0.05$) because gill nets required more labors to pull the net (average length of 8 km). The lowest number of labors was found in the stow nets fishing which requires only 2-3 labors in one boat (Table 3).

The results in Table 3 show that the number of family labor engaged in fishing on fishing boats is only 1-3 workers. The remaining labors works had to be hired by more workers to ensure the fishing work on the fishing boats. The number of employees in the trawlers was higher than that of other fishing types ($p < 0.05$). In general, the fisheries sector in the coastal provinces of the Mekong Delta provided jobs for the family members of fishermen and also for local people in the coastal area. However, the number of employees was unstable, and the lack of employees was frequent because most of these workers moved to occupational zones with better working conditions than on the sea.

3.1.2 Fishing vessels and fishing gear

Fishing vessels are mainly made by wood. Due to the in-shore fishing and the short time of the trip, many fishing vessels had small loading capacity, ranging from 3.98 to 10.99 tons. The

loading capacity of gill net boats (8 km of the long net) was larger than other fishing types ($p < 0.05$). The smallest loading capacity (3.89 tons) was found in the stow net because these boats were used only for carrying fisherman and fishing products in a short distance. Similarly, the machine horse power of stow net boats were smaller than the machine horse power of gill net boats and trawl net boats (Table 4) ($p < 0.05$).

Gill nets, trawl nets and stow nets were different in shape and size. Gill nets had the longest length, following by trawl nets and stow nets (Table 5). The mesh size determines the size of the fish caught. The small mesh size prevents escapes of the juvenile fish, thus, affect the aquatic resources. According to the Ministry of Agriculture and Rural Development in Vietnam, the mesh size of the gill net had to be bigger than 44 mm, 28 mm for the trawl net and 20 mm for the stow net (Ministry of Agriculture and Rural Development, 2006). Following the rule, the mesh size in the trawl net and stow net in this study was smaller than the requirement. This is one of the reasons for declining of fishery resources. Therefore, it is necessary to have a strict management policy for these fishing activities.

3.1.3 Fishing grounds and fishing seasons

Fishing ground of fishermen in coastal province in the Mekong Delta are the sea areas from Vung Tau to Ca Mau and the Gulf of Thailand. The sea area from Vung Tau to Ca Mau had fish stock of 909,879 tons and the ability to exploit aquatic products was 425,952 tons. The Gulf of Thailand had a reserve of 478,689 tons and an exploitable capacity of 425,952 tons (Son, 2005). Both fishing grounds were favorable conditions for sustainable exploitation for the fishing sector in Mekong Delta, Vietnam. Fisheries activities could be taken place in the whole year, except bad weather. The number of fishing trips per year was more or less dependent on the duration of a trip, which is long or short. The results showed that the number of fishing trips in one month of trawl nets and gill nets were lower than in the stow nets ($p < 0.05$).

3.1.4 Fishing yield

Due to the characteristics of different fisheries activities in terms of scale and loading capacity, the yield of different fisheries activities should be different. Results showed that the trawl net had the highest yield (592 kg/HP/year) following by the gill net (506 kg/HP/year) ($p < 0.05$). According to Long and

Phuong (2010), the yield of trawls and gill nets were 0.46 tons/HP/year and 1.02 tons/HP/year, respectively. This result shows that the yield of gill nets currently tends to decrease. In another hand, Nhien and Dinh (2012) reported that the productivity of marine fisheries decreased by 38.2%. In-shore fishing along the coastal line surely reduces the fisheries resources, thus there is an urgent need to promote offshore fishing for fishermen in coastal provinces in the Mekong Delta, Vietnam. The trash-fish ratio in the fishing products was different among fishing types, depending on the fishing characteristics. Results show that the ratio of trash-fish in different fishing types was statistically significant ($p < 0.05$), in which the highest ratio of trash-fish was found in the trawl nets and the lowest one was in gill nets (Table 7). Previous study revealed that in single trawl net and gill net, the ratio of trash-fish of fishing production in offshore fishing was lower than that of near-shore fishing (Long, 2014). This implies that the development of offshore fishing increases the catching productivity while reducing the pressure on the shoreline fisheries, thus reducing the impact on fisheries resources.

Table 6: Fishing schedule of different fishing types

Contents	Gill nets	Trawl nets	Stow nets
Time of fishing batch (hours)	4.59±3.31 ^b	3.21±0.76 ^a	4.97±1.07 ^b
The number of fishing batch in a day (batch)	1.91±0.94 ^b	3.36±0.62 ^c	1.24±0.43 ^a
The days in a fishing trip (days)	6.75±1.66 ^c	4.96±1.03 ^b	1.02±0.12 ^a
The fishing trip in a month (trips)	3.00±0.40 ^a	2.99±0.59 ^a	20.27±6.07 ^c
The fishing month in a year (months)	8.55±0.85 ^a	9.61±2.07 ^b	10.09±2.16 ^c

Values of the same row with different letters were significantly different ($p < 0.05$)

Table 7: Exploitation yields of different fishing types

Contents	Gill nets	Trawl nets	Stow nets
Yield (kg/trip)	612±109 ^b	724±218 ^c	39±15 ^a
Production (tons/year)	15.68±3.86 ^b	20.42±7.64 ^c	7.17±2.33 ^a
Productivity (kg/HP/year)	506±297 ^a	592±214 ^b	-
Ratio of trash-fish (%)	13.8±2.94 ^a	38.4±15.1 ^c	30.9±6.6 ^b

Values of the same row with different letters were significantly different ($p < 0.05$)

3.2 Financial aspects of fishing activities in the Mekong Delta

3.2.1 Costs of fishing activities in the Mekong Delta

The initial cost of fishing activities are mainly the purchase of boat hulls, engines and fishing gear (fixed costs). Depending on the fishing types, their cost ratios are different. The results showed that the highest costs were for buying boat hulls and gears for gill nets fishing; for trawl nets, the highest costs were for buying boat hulls and engines, and for stow nets fishing was of purchasing fishing gears (Table 8). There was a statistically significant difference in the fixed costs between fishing activities ($p < 0.05$). The fixed costs of gill net fishing were the largest (425.1 million VND), following by trawl net (VND 157.6 million) and stow net (VND 27.7 million).

Depending on the age of the boat hull, engine, fishing gear and the number of fishing trips per year, the depreciation cost between fishing activities was different. Results showed that the depreciation cost of fishing types were significantly different

($p < 0.05$), in which gill nets had the highest depreciation cost and stow nets had the lowest depreciation charge (Table 8).

Variable costs included all costs related to fishing operations. These expenses included fuel, ice, salt, food and labor costs. Table 9 shows that variable costs of fishing types are mainly fuel and labor costs. Depending on the characteristics of each fishing types, the ratio of these costs was high or low. For trawls net fishing, fishing vessels operated during catching fishing, so fuel costs accounted for the highest rate (43.43%), while in the other fishing types, the labor cost accounted for the highest ratio. However, the cost of fuel of remain fishing types is also high. When the price of fuel increased, it greatly affected the profitability of the fisheries sector. Therefore, the establishment of fishing teams/groups and increase the transporting fishing products team will help reduce fuel costs and get higher profits.

Table 8: Fixed cost and depreciation of fishing types

Contents	Gill nets	Trawl nets	Stow nets
Fixed cost (million VND)	425±29 ^c	157±54 ^b	27.7±3.8 ^a
<i>In which:</i>			
Cost of buying hull (million VND)	150±22	101±44	5.7±1.4
Cost of buying engine (million VND)	59±10	47.1±39	8.8±2.8
Cost of purchasing fishing gear (million VND)	209±16	8.8±7.2	13.2±1.3
Bank interest (million VND)	7.1±2.0	0.6±0.2	
Depreciation cost (million VND/trip)	5.08±1.13 ^c	0.67±0.69 ^b	0.03±0.02 ^a

Values of the same row with different letters were significantly different ($p < 0.05$)

Table 9: Variable cost structure of fishing types

Contents	Gill nets	Trawl nets	Stow nets
Variable cost (million VND/trip)	17.02±8.88 ^c	13.32±6.90 ^b	0.93±0.58 ^a
<i>In which:</i>			
Fuel (million VND/trip)	3.44±1.77	5.79±3.30	0.18±0.14
Oil (million VND/trip)	0.83±1.38	1.10±0.63	0.03±0.03
Food (million VND/trip)	2.26±0.82	1.85±1.06	0.13±0.08
Ice (million VND/trip)	0.57±0.60	0.87±0.49	0.03±0.02
Labor cost (million VND/trip)	8.40±3.97	3.27±1.73	0.53±0.32
Maintenance costs (million VND/trip)	1.30±2.17	0.35±0.42	0.01±0.01
Other cost (million VND/trip)	0.22±0.92	0.10±0.22	0.01±0.00

Values of the same row with different letters were significantly different ($p < 0.05$)

3.2.3 Financial performance of fishery capture

Table 10 shows that the profit of gill nets was 10.9 million VND/HP/year and it was significantly higher than that of trawl nets (4.27 million VND/CV/year). Rate of return of the fishing types was not high because of the high operation cost and low gross income, except the stow net because of the low operation costs. Compared to the research results of Long and Phuong (2010), the rate of return of the trawl nets decreased significantly. The rate of return of the trawl nets in 2010 was 0.51 times and reduced to 0.45 times in 2017. However, compared to the results of Truong *et al.* (2016), the rate of return of trawl nets in the Mekong River Delta was much higher than that of in Nha Trang province, middle region of Vietnam (0.02-0.06 times).

Compared to other aquaculture activities, for example, white leg shrimp culture in Ca Mau with a rate of return of 1.66 times (Long and Hien, 2015), the black tiger shrimp culture with rate of return of 1.1 times (Long, 2016) and the model of eel farming in Ca Mau with a rate of return of 1.43 times (Long and Hai, 2014). This shows that fishing activities in the Mekong Delta is not as effective as other activities.

The results on financial analysis showed that the fuel cost in fisheries accounted for a high proportion. When the fuel price increased, the production cost increased quickly. However, the selling price of fishery products increased slowly, reduced the gross income, hence reduced rate of return. On the other hand, when the fishery resources decline, the fishery production also decreases, which in turn affects the gross income and rate of return. To gain more in rate of return, it is necessary to have solutions and policy on control the fuel costs and preserve good products at high quality for higher prices. Therefore, the linkage of production and transportation of fishery products may reduce fuel costs, enhance the fisheries products quality for the higher prices and increase gross income. Good fisheries management also contributes to high fishing efficiency and high gross revenue.

3.3 Advantages and disadvantages

Fishing activities in the Mekong Delta are still attractive due to many vessels doing fishing at favorable conditions for fishing ground, labor availability and in-depth experience fishermen. Fishermen tried to follow up with fishing activities and they did not like to convert to other occupations. The short duration of fishing trip should be suitable for investment of fishermen. Besides advantages, trawls, gill nets and stow nets also encountered many difficulties. High production costs affected the income of fishermen. Lacking capital was also a problem for fishermen. Many fishermen had to borrow money for fishing activities at high rates of interest leading to reduce profits. Unpredictable weather affected fishing season, resulting in unstable production, which affected the income of fishermen.

To facilitate the sustainable development of fisheries, works have to be done including (i) strengthening the management and development of fisheries resources such as the development of near-shore fishing boats, force the mesh size following to regulations, banned fishing during the breeding season... (ii) providing favorable policy conditions for fishermen to access bank capital at low interest rates for investment in production (iii) training fishermen to use equipment such as fish detector to find fish quickly, exploit effectively in bad weather conditions.

The research results show that gill nets, trawl nets and stow nets can be exploited all the year round. The boats of trawl nets and stow nets are small loading capacity, and the loading capacity of gill net vessels is larger. The yield of the trawl nets is the highest, following to the gill net and stow nets. However, the ratio of trash-fish in trawl net is the highest and the stow nets is the second one. The rate of trash-fish in the gill net is the lowest. This shows that trawl net and stow net greatly affect the fisheries resources. On the other hand, in terms of the smallest net mesh size of the gears, the net of trawl nets and stow nets fishing have mesh size to be smaller than stipulated, thus contributing to the reduction of fisheries resources. For the sustainable development of fishing activities in the Mekong Delta, it is necessary to restrict or improve the effectiveness of fishing activities which have a great impact on aquatic resources such as trawl nets and stow nets. In terms of financial efficiency, the results show that the gill net profit is the highest. This proves that gill nets operate more effectively than others. Therefore, offshore fishing or gill nets fishing type should be strengthened and enlarged to fishing activities in the Mekong Delta, Vietnam.

Table 10: Financial analysis of fishing types

Contents	Gill nets	Trawl nets	Stow nets
Gross income (<i>million VND/trip</i>)	33.7±6.0 ^c	17.4±5.2 ^b	1.95±0.8 ^a
Total cost (<i>million VND/trip</i>)	22.1±8.6 ^c	12.4±4.5 ^b	0.96±0.6 ^a
Net return (<i>million VND/year</i>)	298±143 ^c	138±62 ^a	200±88 ^b
Net return (<i>million VND/HP/year</i>)	10.9±9.27 ^b	4.27±2.4 ^a	-

Rate of return (times)	0.62±0.31 ^b	0.45±0.21 ^a	1.41±0.70 ^c
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Values of the same row with different letters were significantly different ($p < 0.05$).

IV. CONCLUSION

Gillnets, trawl nets and stow nets are major fishing gears that accounting for the highest number of boats and production in the Mekong Delta. Fishing activities can be done year-round. The capacity of gill net boat was the largest (10.99 tons) ($p < 0.05$) and the yield of trawler was the highest (20.42 tons / year) ($p < 0.05$). Due to the large mesh size of gillnets so the trash-fish had the lowest proportion (13.8%) ($p < 0.05$). The net return of gill nets was the highest (298 million VND / year) ($p < 0.05$) and the rate of return was quite high (0.62 times). The trawler had the highest yield (20.42 tons/year) ($p < 0.05$) but it had the high trash-fish ratio (38.4%) and the lowest rate of return (0.45 times). Stow nets had the highest rate of return (1.41 times) but it had low yield (7.17 tons/year) and high trash-fish ratio (30.9%), so this may affects fisheries resources. The main problems of the coastal fisheries are the lack of capital and erratic weather affecting fishing. In the future, it should be limited to the development of trawler, which will be turned into gill net or offshore exploitation so that fisheries exploitation will be oriented to sustainability.

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AUTHORS

First Author – Nguyen Thanh Long, College of Aquaculture and Fisheries, Can Tho University, Can Tho City, Viet Nam
Second Author – Mai Viet Van, College of Aquaculture and Fisheries, Can Tho University, Can Tho City, Viet Nam
Third author - Dang Thi Phuong, College of Aquaculture and Fisheries, Can Tho University, Can Tho City, Viet Nam
Fourth author – Naoki Tojo, Faculty of Fisheries Sciences, Hokkaido University
Last author - Tran Dac Dinh, College of Aquaculture and Fisheries, Can Tho University, Can Tho City, Viet Nam
Correspondence Author – Nguyen Thanh Long, College of Aquaculture and Fisheries, Can Tho University, Can Tho City, Viet Nam. Email: ntlong@ctu.edu.vn, Tel: 0084908494613, Fax: 0084 2923830323

Rule-Based Pāli Romanization System for Myanmar Language

Lei Lei Win

* Faculty of Computer Science
** University of Computer Studies, Meiktila

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Abstract- Typically, Myanmar is the most religious Buddhist country with regard to the percentage of the population living as monks and the amount of money spent on religion. Pāli is a language that has been widely used in the Buddhist scriptures. Generally, the Pāli words are expressed with stacked consonant so that there may be some difficulties to pronounce the Myanmar Pāli word. Therefore, this paper presents the text to speech system for Myanmar Pāli word by using Romanization rules. Firstly, the input words or sentences in Pāli are accepted. Then, these words are checked as it is Pāli words or not by using rules for Pāli. After that, these Pāli words are converted into their corresponding roman symbols by using Romanization rules for Pāli. Finally, the system generates the speech of Pāli words. The aim of this paper is to help the Buddhists and the new Buddhist students who are unfamiliar with some of the Pāli words offer used in the study of Buddhism. According the experimental result, the system achieved the acceptable level of accuracy.

Index Terms- Pāli language, Text-to-speech, Romanization rules

I. INTRODUCTION

Text to speech system is the conversion of the input text into their corresponding output speech. Myanmar language is the official language and it is tonal, pitch-register and syllable time language. Moreover, the nature of Myanmar language is monosyllabic and analytic language. The sentence order is “subject-object-verb”. It also known as Burmese and it is a member of the Lolo-Burmese grouping of the Sino-Tibetan language family. The language uses a Brahmic script called the Burmese script. The Burmese alphabet consists of 33 letters and 12 vowels, and is written from left to right. It requires no spaces between words, although modern writing usually contains spaces after each clause to enhance readability. Besides the Burmese language, the Burmese alphabet is also used for the liturgical languages of Pāli and Sanskrit. Pāli is the language used to preserve the Buddhist canon of the Theravada (ထေရဝါဒ) Buddhist tradition (is a branch of Buddhism that uses the teaching of the Pāli Canon, a collection of the oldest recorded Buddhist texts, as its doctrinal core), which is regarded as the oldest complete collection of Buddhist texts surviving in an Indian language. Pāli is closely related to Sanskrit, but its grammar and structure are simpler. Traditional Theravadins regard Pāli as the language spoken by the Buddha himself, but in

the opinion of leading linguistic scholars, Pāli was probably a synthetic language created from several vernaculars to make the Buddhist texts comprehensible to Buddhist monks living in different parts of northern India. As Theravada Buddhism spread to other parts of southern Asia, the use of Pāli as the language of the texts spread along with it, and thus Pāli became a sacred language in Sri Lanka, Myanmar, Thailand, Laos, Cambodia and Vietnam. Pāli has been used almost exclusively for Buddhist teachings, although many religious and literary works related to Buddhism were written in Pāli at a time. So Pāli is a spoken language, written in the script of the land where it is used: for example, in Myanmar, it is written in Myanmar script. Strictly speaking Myanmar and Indic scripts are abugidas (alpha-syllabaries) and not alphabets [1].

Myanmar language has been greatly influenced by the Pāli language due to the widespread practice of Buddhism and the study of Buddhist scriptures in Myanmar. [2] expressed that the essentially Indian genius, the psychological subtleties, and high thoughts of Buddhism have forced the Burmese language to grow, deepen and expand continually. As a consequence of Pāli influence on Myanmar language, usages of Pāli and Pāli derived words are wide and frequent in Myanmar text. Some Pāli words were directly incorporated into Myanmar language. Later era, the re-researchers focus on speech processing. Therefore, this paper presents text to speech system for Myanmar Pāli words by using Romanization rules to help the people who are interested in Pāli that is writing in roman script. It can also help the students and teachers of oriental studies.

[3] proposed the system to use for geographical names in the democratic people's republic of Korea. Its contains the Romanization of Hangeul. The way to write Thai language using roman alphabets are proposed by [4]. It could be performed on the basis of orthographic form (transliteration) or pronunciation (transcription) or both. Romanization system for Japanese Kana is proposed by [5]. It has been in use by the U.S. Board on Geographic names and the U.K. [6] is the system of the Romanization of Shan. It has been developed for use in Romanization names written in the Shan script.

The rest of paper is organized as follow: in Section II, Pali language is explained. The nature of Pali word in Myanmar language is presented in Section III. The architecture of the proposed system is explained in Section IV with the step by step explanation. The paper is concluded in Section V.

II. PĀLI LANGUAGE

Language is the speech, spoken by the people for communication, composed of letters (akkharā) or alphabet. Pāli is the language in which is composed the Tipiṭaka. The word Pāli is used in the sense of "Text", sacred Text and the same thing for the etymology of Pāli is the Holy Text, the Scriptures or the canon. Pāli language is a branch of Indo-European family and a sister language of Sanskrit. Pāli was first committed to writing in Sṛlāṅkā in the 1st century AD for the Buddhist Canon. It is the spoken language. It has no own script but only sound. So, Pāli is transliterated into various local scripts. Pāli is an inflectional language (declension, conjugation, assimilation). Pāli had contributed mostly to the growth of Myanmar as a national language. Brahmanism, Hinduism, Buddhism, Sanskrit and Pāli have been well introduced to Myanmar from the beginning of our history of 4th century AD. The Myanmar invented Myanmar Script using Pallava Script. Moreover, phonetics and ideas were taken from Pāli language and literature. As Theravada Buddhism flourished in Myanmar, Pāli became the medium of writing [7].

III. PĀLI WORD NATURE IN MYANMAR LANGUAGE

Every language has its own alphabet which contains letters of that language. They are called akkharā, lipi, script or writing. The Akkharā (alphabet) means one which is eternal or imperishable, however, they are pronounced or used. Therefore, the original meaning of alphabet is "sound". As they describe the quality of sound, they are also called syllable (vanna). Ka, kha, ga, gha, na, etc. are characters of alpha-bet, these characters are called script (lipi). Generally, Pāli is the name of a language and it has no own script. When its alphabets are written, various scripts are used: in Myanmar the Myanmar, in India Devanāgarī, in Sṛlāṅkā the Sinhalese, in Thailand the Siamese, etc. The speech spoken in a language can be written with symbol that are so called alphabet or script. Languages such as English, German used Roman script in writing. Because of Roman origin, it is called Roman script. Romanization is the representation of a language written in a non-Roman script using the Roman alphabet. In the Myanmar writing system, as example, ကံ၊ခါ၊ဂါ၊ဃါ၊ဇါ are Myanmar script and the corresponding Roman scripts are k, kh, g, gh, ṅ. The Pāli alphabet contains 8 vowels, 33 consonants, and 1 nasal sound. All vowels can produce their sounds by themselves. Consonants cannot produce their sounds by themselves. So they are called mutes which produce their respective sounds only in combination with the vowels. Pāli language contains 41 letters. The Pāli words are pronounced with defined Ṭhān [8]. Ṭhān means the organ of articulation. There are six organs of articulation in Pāli. They are –

- Kaṅṭha- Gutturals throat
- Tālu- Palatals, hard plate
- Muddha- Cerebrals, soft plate
- Danta- Dentals, teeth
- Oṭṭha- Labials, lips
- Nāsā- Nasals, nose

The 33 consonant can be classified into six groups according to the above six Ṭhān. Therefore, the Pāli alphabet for both Myanmar script and Roman script classified with Ṭhān are

described in Table I and II. Moreover, it can also be classified with Vagga and Avagga sound as shown in Table III and IV.

TABLE I. Vowel in Myanmar script

Vowels							
အ	အာ	ဣ	ဤ	ဥ	ဦ	ဧ	ဩ

TABLE II. Consonant in Myanmar script

Consonants				
က	ခ	ဂ	ဃ	င
စ	ဆ	ဇ	ဈ	ည
ဏ	တ	ထ	ဒ	ဏ
ပ	ဖ	ဗ	ဗ	မ
ယ	ရ	လ	ဝ	သ
	ဟ	ဌ	အံ (')	

TABLE III. Vowel in Roman script

Ṭhān	Short (Rassa Sara)	Long (Dhīgha Sara)
Gutturals	a	ā
Palatals	i	ī
Labials	u	ū
Gutturals+ Palatals	e	
Gutturals+ Labials		o

TABLE IV. Vowel in Roman script

Ṭhān	Vagga					Avagga (Unclassified)
	(Classified)					
	Unaspirate	Aspirate	Unaspirate	Aspirate	Nasals	h
First	Second	Third	Fourth	Fifth		
Kaṅṭha	k	kh	g	gh	ṅ	y
Tālu	c	ch	j	jh	ñ	r, l
Muddha	ṭ	ṭh	ḍ	ḍh	ṇ	l, s
Danta	t	th	d	dh	n	v
Oṭṭha	p	ph	b	bh	m	y
Nāsā					ṃ	

IV. PROPOSED SYSTEM ARCHITECTURE

There are four main modules in the proposed Pāli Romanization system: (i) text normalization, (ii) check the input text is Pāli word or not, (iii) Romanized the Pāli word and finally (iv) generate the speech of the Romanized Pāli words. Firstly, the input Myanmar Pāli words are preprocessed as syllable segmentation for the next processing. Then, the normalized words are checked which are Pāli words or not. If it is Pāli words, these are transformed into Roman script by using proposed Romanization rules. Finally, the system generated the speech output of the Myanmar Pāli words. The system architecture of the proposed system is shown in Fig 1.


```

22. Else If ("o" is over (ဝဲထံနမဝဝဠ)) then
23.     ISPALI = true;
24. Else If (current syllable does not contain (excludeWord)) then
25.     ISPALI=true;
26. Else
27.     ISPALI=false;
28. End if
29. End procedure
End
    
```

Fig.3. The algorithm for checking Myanmar Pāli words

C. Romanized Pāli Words

In linguistics, Romanizaion is the conversion of writing from a different writing system to the Roman (Latin) script, or a system for doing so. Methods of Romanization include transliteration, for representing written text, and transcription, for representing the spoken word, and combinations of both. Transcription methods can be subdivided into phonemic transcription, which records the phonemes or units of semantic meaning in speech, and stricter phonetic transcription, which records speech sounds with precision [11].

Myanmar language is one of few alphabets capable of transcribing Pāli text with 100% orthographic fidelity. However, because Pāli is no longer a spoken, but a written language, the standard pronunciation of Pāli text occurs in agreement with the phonetic values and inherent rules of the corresponding alphabets used. Accordingly, like other language such as Thai, Sinhala, Lao and Khmer, speakers, the Myanmar have a very distinct accent when using Pāli words.

After checking the input word is a Pāli or non-Pāli word, if the input word is Pāli, the system converted into their corresponding Romanized symbol. Therefore, we created the Romanized table as shown in Table V. Then, the input Pāli words are transformed into Roman script by using the following 10 Romanization rules with example words.

TABLE V. Romanization table

Consonant	Unicode	Roman_Symbol
က	U+1000	k
ခ	U+1001	kh
ဂ	U+1002	g
...		
ဥ	U+102f	u
ဦ	U+1030	ū
ဧ	U+1031	e

Rule 1. Combination of Consonant with Vowels

k+ a= ka (က), k+ i= ki (ကီ), k+ u= ku (ကု), k+ e= ke (ကေ)
k+ ā= kā (ကာ), k+ ī= kī (ကီ), k+ ū= kū (ကူ), k+ o= ko (ကေ)

Rule 2. Combination of the vowels with the niggahita

a+ ṁ= aṁ (အံ), i+ ṁ= iṁ (အိ), u+ ṁ= uṁ (အူ)
ā+ ṁ= āṁ (အံ), ī+ ṁ= īṁ (အိ), ū+ ṁ= ūṁ (အူ)

Rule 3. Combination of the consonants, vowels with the niggahita

k+ a+ ṁ= kaṁ (ကံ), k+ i+ ṁ= kiṁ (ကိ), k+ u+ ṁ= kuṁ (ကူ)
k+ ā+ ṁ= kāṁ (ကံ), k+ ī+ ṁ= kīṁ (ကိ), k+ ū+ ṁ= kūṁ (ကူ)

Rule 4. First Group alphabet+ First Group alphabet

k+ k= kk sakka (သကုက)
c+ c= cc sacca (သဗ္ဗစ)
t+ t= tt vatta (ဝဠု)
t+ t= tt satta (သတုတ)
p+ p= pp sappa (သပုပ)

Rule 5. First Group alphabet+ Second Group alphabet

k+ kh= kkh yakkha (ယကုခ)
c+ ch= cch accha (အစုဆ)
t+ th= tth sattha (သတုထ)
p+ ph= pph puppha (ပုပုဖ)

Rule 6. Third group alphabet + Third group alphabet

g+ g= gg agga (အဂုဂ)
j+ j= jj ajja (အဇုဇ)
d+ d= dd bhadda (ဘဒုဒ)
b+ b= bb sabba (သဗ္ဗစ)

Rule 7. Third group alphabet+ Fourth group alphabet

g+ gh= ggh byaggha (ဗျဂုဃ)
j+ jh= jjh majjha (မဇုဈ)
d+ dh= ddh buddha (ဗုဒုဓ)
b+ bh= bbh labbhati (လဗ္ဗဘတိ)

8. Fifth group alphabet+ Consonant of same Thān

ñ+ g= ṅg maṅgala (မင်္ဂလ)
ñ+ c= ñc pañca (ပဉ္စစ)
ṇ+ ḍ= ṇḍ kaṇḍa (ကဏ္ဍဉ)
n+ t= nt ananta (အနန္တတ)
m+ bh= mbh sambhūla (သမုဘူလ)

9. Combination of Avagga letters

y+ y= yy seyya (သေယျ)

y+ v= yv	yvāham (ယွာဟံ)
y+ h= yh	paggayha (ပဂ္ဂယှာ)
v+ h= vh	avhayati (အဝါ ယတိ)
l+ l= ll	vallari (ဝလ္လရိ)
l+ y= ly	kalyā (ကလျာ)
s+ y= sy	nisya (နိယှာ)
s+ v= sv	svāham (သွာဟံ)

10. Combination of the Vagga with Avagga

k+ y= ky	sakyamuni (သကျမုနိ)
k+ r= kr	cakra (စကရ)
d+ v= dv	dvāra (ဒွါရ)
n+ h= nh	nhāna (နာနာ)

The example Romanized Pāli sentence is shown in Table by using the mentioned Romanization rules.

TABLE VI. Sample Romanization result

Input Pāli Sentence	နမော တဿ ဘဂဝတော အရဟတော သမုဗ္ဗာ သမုဗ္ဗဒဓဿ
Romanized Sentecne	Namo tassa bhagavato arahato sammā ssambuddhassa

D. Generated Pāli Speech

In the speech generation step, the converted roman scripts are transformed again into speech output. MaryTTS speech engine is used in this potion. MaryTTS is a multilingual Text-to-Speech Synthesis platform written in Java and it is an open-source platform. It was originally developed as a collaborative project of DFKI’s Language Technology Lab and the Institute of Phonetics at Saarland University. Now, Multimodal Speech Processing Group in the Cluster of Excellence MMCI and DFK maintain the MaryTTS. As of version 5.2, MaryTTS supports German, British and American English, French, Italian, Luxembourgish, Russian, Swedish, Telugu, and Turkish; more languages are in preparation.

MaryTTS comes with toolkits for quickly adding support for new languages and for building unit selection and HMM-based synthesis voices [12].

V. EXPERIMENTAL RESULT

Generally, the performance of Myanmar Pāli word Romanization can be calculated in different ways. In this system, the goodness of transformation is measured by four types of outcomes: (1) Correct Transformed (CT): A Pāli word was converted correctly and is detected to be correct; (2) Correct Rejection (CR): A Pāli word was transformed incorrectly and is

detected to be incorrect; (3) False Transformed (FA): A Pāli word was converted incorrectly and is detected to be correct; (4) False Rejection (FR): A Pāli word was transformed correctly and is detected to be incorrect. For this four measure, 500 Pāli sentences are tested. The experimental results are shown in Fig 4. Typically, the performance of an error detection algorithm can be calculated in different ways. One way is to measure the scoring accuracy (SA), which is calculated by formula shown below:

$$SA = ((CT+CR) / (CT + CR + FT + FR)) * 100;$$

The ratio of CTs and CRs can be calculated by the classification algorithm: precision, recall, and F-measure metrics. These measurements are as follows:

$$\text{Precision of CT} = (CT / (CT + FA)) * 100;$$

$$\text{Precision of CR} = (CR / (CR + FR)) * 100;$$

$$\text{Recall of CT} = (CT / (CT + FR)) * 100;$$

$$\text{Recall of CR} = (CR / (CR + FA)) * 100;$$

$$F\text{-measure} = \frac{2*(Precision*Recall)}{(Precision+Recall)}$$

VI. CONCLUSION

This paper presented the rule based Myanmar Pāli word Romanization system. Therefore, the ten Romanization rules are discussed. Before the Pāli words are Romanized, the input words are checked that they are Pāli word or not. Consequently, the Myanmar Pāli word checking algorithm is presented. This paper is mainly focus on Myanmar Pāli word checking and Romanized these Pāli words so that the MaryTTS engine is used for speech generation. According to the experimental result for Romanization, the system achieved the overall accuracy is 89.6. For some words, such as “အောင်မင်္ဂလာ”. In this word, although “မင်္ဂလာ” is Pāli word, the syllalbe “အောင်” is not Pāli word. In this case, the system may wrongly check as the Pāli words. In this case, the accuracy may be decreased. Nowadays, in Myanmar, the researchers focus on the speech processing in Myanmar natural language processing. In the future, the high quality speech output will be generated by using other speech synthesis methods like concatenation speech synthesis approach by recording own voice for Pāli words.

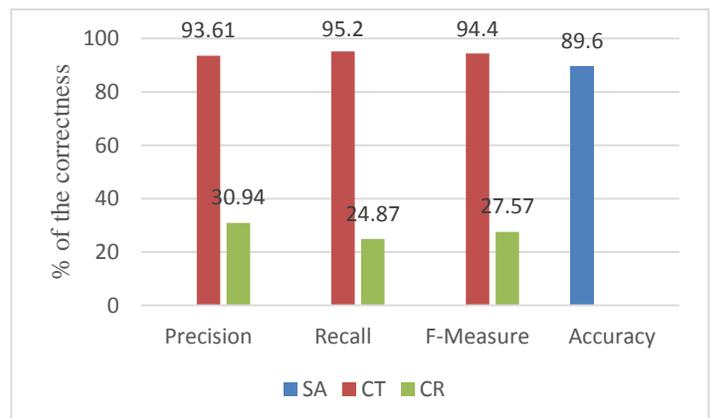


Fig.4. The experimental result of the Myanmar Pāli word
Romanization

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Influence of Human Resource Development Practices on Performance of Academic Staff in Technical Training Institutions in Kenya: A Case Study of Thika Technical Training Institute

Leah Nyambura Kariuki^{*}, Dr. Susan Wekesa^{**}

^{*} MSC HRM, Candidate (Jomo Kenyatta University of Agriculture and Technology) P.o Box 105-60103 Runyenjes, Kenya

^{**} Department of Entrepreneurship, Technology, Leadership and Management, Jomo Kenyatta University of Agriculture and Technology, P.o Box 62000-00100 Nairobi, Kenya

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Abstract- The aim of the study was to determine the influence of human resource development practices on performance of academic staff in Technical Training Institutions in Kenya focusing on Thika Technical Training Institute (TTTI). The objective of the study was to determine the influence of training, career development and employee empowerment on performance of academic staff in Thika Technical Training Institute. This study adopted case study research design. The study targeted 250 academic staff across five departments of TTTI, from which a sample of 100 respondents were drawn for the study. The sample was selected through stratified sampling technique. The study used both self-reported questionnaires and interview guides to collect data from the respondents. Self-reported questionnaires were given to the lecturers of TTTI and interviews were done to the heads of departments in TTTI. Primary data was collected through the use of questionnaires, whereas secondary data was obtained through existing literature related to the current research topic under study. The qualitative data was analyzed using content analysis whereas quantitative data was analyzed using descriptive statistics and presented in the form of frequencies, percentages, mean and standard deviation. Inferential statistics was obtained by means of correlation analysis and multiple regression analysis to explain relationship between variables using SPSS version 21 computer program. The results indicated that there was a positive relationship between performance of academic staff in Thika Technical Training Institute and training, career development and employee empowerment. The study concluded that all the three variables under study are statistically significant in explaining the performance of academic staff in Thika Technical Training Institute. The study recommended that there was need to introduce both short term and long term training programs to the academic staff, introduce career development opportunities and elements associated with empowerment such as authority delegation, job enrichment, autonomy, and knowledge sharing should be incorporated in employee empowerment as they are significant in employee performance.

Index Terms- Human resource development, Training, Career development, Employee empowerment

I. INTRODUCTION

Human resources are an organization's greatest asset because without them, everyday business functions such as managing cash flow, making business transactions, communicating through all forms of media, and dealing with customers cannot be completed. Human resources and the potential they possess are key drivers for an organization's success. With globalization and technological advances, today's organizations are continuously changing. Thus, organizational change impacts not only the business but also its employees. Human resource development (HRD), as a crucial part of human resource management, is an effective instrument to ensure that the intellectual capital of an organization can contribute to its competitive advantage (Subramaniam & Youndt, 2005). Organizations that spend a lot of money on the development of their employee anticipate that this results to a competitive advantage in the long run (Aguinis & Kraiger, 2009). Implications of the HRD process show how HRD can be designed or administered. Even though learning and development interventions are aimed to enhance individual, group and organizational performance (Yamhill & McLean, 2001), the present study focuses on the performance of the individual academic staff behavior and not on group or TTI performance in Kenya.

In a study on the effect of training and Development on Employee Performance at Accra Polytechnic it was found that training and development had positive impact on employee performance of the Polytechnic. For employees to carry out their duties effectively and efficiently they must have the relevant skills, knowledge, values, attitudes and competencies as well as understand their organization's culture. The results of this study revealed that the correlation between employee performance and training and development were highly significant (DeGraft-Otoo, 2012).

A well-designed career development system enables organisations to tap their wealth of in-house talent for staffing and promotion by matching the skills, experience, and aspirations of individuals to the needs of the organisations. In addition, it

enables them to make informed decisions around compensation and succession planning to attract, retain and motivate the employees, resulting in a more engaged and productive workforce (Thite, 2001; Kapel & Shepherd, 2004; Kaye, 2005). Another study found out that empowerment tools such as Power, Knowledge, Information Sharing and Rewards influences the employee’s performance (Yasothai, Jauhar, & Bashawir, 2015). Meyerson and Dewettinck (2012) from their findings found that employee empowerment emphasizing the factors, delegation, participating management, encouragement and giving reward cause employee’s performance to improve. From the previous literature reviewed above in this study it is evident that the HRD practices training, career development and employee empowerment affect employee performance. Therefore, this study sought to seek the influence of HRD practices on performance of academic staff in technical training institutions in Kenya focusing on Thika Technical Training Institute as a case.

II. OBJECTIVES OF THE STUDY

The general objective of this study was to determine the influence of human resource development practices on performance of academic staff in Thika Technical Training Institute.

The study was guided by the following specific objectives;

1. To determine the influence of training on performance of academic staff in Thika Technical Training Institute.
2. To establish influence of career development on performance of academic staff in Thika Technical Training Institute.
3. To assess influence of employee empowerment on performance of academic staff in Thika Technical Training Institute.

III. METHODOLOGY

3.1 Target Population

Table 1: Target Population

Departments in Thika Technical Training Institute	Target Population	Percentage
Business Studies	63	25%
Information and Communication Technology	50	20%
Engineering	37	15%
Health and Applied Sciences	50	20%
Human Resource Management	50	20%
Total	250	100%

Source: Thika Technical Training Institute Human Resource Records

3.2 Sample and Sampling Technique

Table 2: Sample Size

Departments in Thika Technical Training Institute	Target Population	Sample Ratio	Sample Size
Business Studies	63	0.4	25
Information and Communication Technology	50	0.4	20
Engineering	37	0.4	15
Health and Applied Sciences	50	0.4	20
Human Resource Management	50	0.4	20
Total	250	0.4	100

Source: Research Data,2018

Stratified sampling technique was used to select the sample. Sekaran (2010) emphasize that stratified random sampling helps achieve intended representation from various subgroups in any given population, with generalization that has minimal bias. The respondents were drawn from the “strata” which comprises of respondents’ departments in Thika Technical Training Institute.

3.3 Research Instrument, Data Collection Procedures and Data Analysis

The study adopted two research instruments that includes questionnaire to the respondents and conducted interviews to the head of departments so as to gain detail information since it is a

case study. The questionnaires were distributed with the help of the Thika Technical Training Institute head of departments to the selected sample size. These questionnaires were in form of a Likert scale anchored by a five-point rating ranging from strongly disagree, disagree, neither agree nor disagree, agree, to strongly agree. Closed-ended questions were used as per the recommendations by Gay (1992) who maintains, that closed-ended questions generate specific responses and allow easy analysis of data.

Face to face interviews were conducted where the Heads of department in the five departments in TTTI were interviewed because they deal directly with academic staff issues and are the custodians of their records. The interviews were used to elicit information on effect of human resource development practices

on performance of academic staff in Thika Technical Training Institute from the management perspective.

In order to start the data collection process, the researcher obtained all the necessary documents, including an introduction letter from the Jomo Kenyatta University of Agriculture and Technology. The researcher then took the formal introduction letter to Thika Technical Training Institute management in order to seek permission to carry out the study. A pilot study of 10 academic staff was carried out at Thika Technical Training Institute test the reliability and validity of the questionnaires. Once the pilot study was completed, the other academic staff at Thika Technical Training Institute was then issued with the questionnaires which were collected after 2weeks.

The quantitative data was analyzed using both descriptive and inferential statistics. Descriptive statistics was quantified using percentages, frequencies, mean, and standard deviation while inferential statistics was quantified using correlation and regression to explain the relationships between the independent variables and the dependent variable using SPSS version 21. Correlation measures indicate the degree of association between three or more variables simultaneously (Cohen *et al.*, 2007).

Pearson's product-moment correlation coefficient (PPMCC) analysis was conducted for this study at 95% confidence interval and 2-tailed 5% level of confidence to examine the strength of the relationship between the variables (training, career development and employee empowerment); by examining the statistical significance of the relationship; and by examining the amount of the correlation coefficient. According to Saunders, Lewis, and Thornhill (2009), this correlation coefficient (usually represented by the letter r) can take on any value between -1 and +1. Therefore a value of +1 represents a perfect positive correlation, while a value of -1 represents a perfect negative correlation and a value of 0 meaning the variables are perfectly independent.

According to Cohen *et al.*, (2003) multiple regression is a flexible method of data analysis that may be appropriate whenever a quantitative variable (the dependent) is to be examined in relationship to any other factors (expressed as independent variables) The regression model applied in this study was as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

Where Y is the dependent variable that is performance of academic staff

β_0 is the constant

$\beta_1, \beta_2, \beta_3$ is the slope of each independent variable

X_1 , Employee training

X_2 career development

X_3 employee empowerment

e error term

IV. RESULTS AND DISCUSSION

4.1 Information on Respondents

The results obtained showed that majority of the respondents 65.7 % were men while the remaining 34.3% were women. The findings also showed that 11% of the respondents were below 25 years of age, 26% were between 25-35 years of age, 51% were between 35-45 years of age and 12% were above 45 years of age. This showed that the majority of the respondents were between 35-45 years of age.

In terms of education level, the results showed that, 23% of the respondents were diploma holders, 66% were first degree holders, while only 9% had a master's degree and only 2% had Doctorate degree. The findings reveal that majority of the respondents were first degree holders in TTTI.

Findings also showed that, 20% respondents had worked in Thika Technical Training Institute for less than 5 years while 51% respondents had worked for between 5-10 years, and 29% respondents had worked above 15 years. These results indicate that majority of the respondents had worked for a period of 5-10 years.

In terms of employment status, the findings of the study showed that, 63% of the respondents in TTI had been employed as permanent and pensionable, while 37% were employed on contract terms and none of the respondents had been employed Temporary. These findings show that most of the respondents at Thika Technical Training Institute are employed as permanent and pensionable terms and this have a positive effect on employee performance

The results also revealed that 29% respondents were from business studies department, 17% respondents were from information and communication technology department, 11% respondents were from engineering department, 20% respondents were from health and applied sciences department, while 23% respondent was from human resource management department. This indicates that most respondents at Thika Technical Training Institute were from business studies department.

4.2 Training and Employee Performance

The findings indicated that the respondents agreed that their supervisor did not identify their training needs yearly indicating gaps in performance indicated by a mean of 2.64 and standard deviation of 1.143. The respondents agreed that their performance improves when provided with short term training programs indicated by a mean of 3.17 and standard deviation of 1.372. The respondents agreed their performance is not impacted by long term training programs provided by TTTI indicated by a mean of 3.49 and standard deviation of 0.974.

The findings on long term training are in line with Hannagan (2002) who conducted a study on management concepts and practices who argued that there is no guarantee that trained employees actually benefit from participation in training and that employees are usually unproductive especially while undergoing long term training let alone the additional expenses. The findings on short term training are supported by Ambetsa (2006) whose finding on the contribution of technical and vocational training to sustainable development found out that short term training contributes to individual's personal development, increases their productivity and income at work and facilitates everybody's participation.

The findings on short term training are supported by Ambetsa (2006) whose finding on the contribution of technical

and vocational training to sustainable development found out that short term training contributes to individual's personal development, increases their productivity and income at work and facilitates everybody's participation.

Thematic Analysis of Qualitative Findings on the Influence of Training on Employee Performance

Head of departments who were interviewed also indicated that the academic staff who undertook further training in TTTI showed positive performance changes. The HOD's further noted that, there was significant improvement on employee performance on the employees who were involved in short term training opportunities and there was positive noticeable changes from academic staff who had been promoted with regard to their performance in teaching, research and consultancy services in TTTI.

These views corroborate with the views expressed by Ambetsa (2006) whose finding on the contribution of technical and vocational training to sustainable development found out that short term training contributes to individual's personal development, increases their productivity and income at work and facilitates everybody's participation.

4.3 Career Development and Employee Performance

Findings showed that the respondents agreed that they did their best in their jobs if they knew that they had an equal chance of making it to the top through career advancement indicated by a mean of 3.29 and standard deviation of 1.131. The respondents agreed that their performance improved when provided with coaching programs indicated by a mean of 3.07 and standard deviation of 0.968. The respondents agreed that their performance was determined by the kind of career counseling opportunities provided by their employer indicated by a mean of 3.38 and standard deviation of 0.133.

The findings on equal chance of making it to the top through career advancement are in agreement with Morishima (2001) who conducted a study on Evolution of white collar human resource management who argues that promotion opportunities increase the level of individual performance and organizational commitment among workers in their career advancement, influences the worker's behavior's and attitudes such as motivation and organizational commitment, particularly in the case of stable employment. The findings on coaching programs are in line with a study conducted by Myers(2000) on Employee problem and prevention counseling who notes that employees who derive satisfaction from knowing that expectations through career counseling can be met inside the organization will most likely become a highly productive employee.

Thematic Analysis of Qualitative Findings on the Influence of Career Development on Employee Performance

The HOD's who were interviewed echoed that career development had positive influence on employee performance of academic staff in TTTI, this was due to the embrace of coaching and career counseling opportunities offered to the employees by the institution. These views further lend credence to the assertions of CIPD (2013) on a study in coaching and mentoring which reveals that coaching is an important part of training and

development of employees. Coaching targets high improvements and high performance of the people at the workplace and generally focuses on particular goals and skills; however, it might also have some effects on personal attributes of an individual like confidence and social interaction.

4.4 Employee Empowerment and Employee Performance

According to the research findings the respondents agreed that delegation enhanced their level of job performance indicated by a mean of 3.38 and standard deviation of 0.133. The respondents agreed that they performed well if they have a lot of power and control over how they do their job and allowed to make decisions on their job indicated by a mean of 3.99 and standard deviation of 1.429. The respondents agreed that knowledge sharing had positive influence on their performance because the more they know, the better they can perform indicated by a mean of 3.30 and standard deviation of 1.132.

The findings on power and control over job are supported by Yasothai *et al.*(2015) who conducted a study on the Impact of Empowerment on Employee Performance, who noted that power sharing empowers individuals from all dimensions. It also provides an employee more authority in performing their tasks, more freedom to contribute ideas at higher levels of decision making, more confidence to think and stay as organizational partners, and better strategy to handle effectively and creatively in new working environments. The findings on delegation can be supported by Al-Jammal *et al.*(2015) who conducted a study on The impact of the delegation of authority on employees' performance at great Irbid municipality, who noted that on the level of an organization, delegation achieves competitive advantage, knowledge inventory, increases the level of productivity and speed in finalizing tasks effectively. The findings on knowledge sharing can further be supported by Simon and Galunic(2004) in their study on how knowledge heterogeneity influences managerial performance and innovativeness, who argues that in a European telecommunications company access to a wide knowledge sharing is an equally importance for overall employee performance.

Thematic Analysis of Qualitative Findings on the Influence of Employee Empowerment on Employee performance

During the interviews the HOD's noted that academic staff of TTTI performed better when given have a lot of power and control over how to do their job and allowed to make decisions on their job undertakings. The interviewees further noted that, delegation of authority, power sharing and knowledge sharing improved the performance of academic staff of TTTI because the more they know, the better they perform. These views corroborate the findings of a study on The impact of the delegation of authority on employees' performance at Great Irbid municipality conducted on by Al-Jammal *et al.*(2015) who reveals that delegation of authority is one of modern trends practiced by managers. Its function stands out contributing and increasing the level of motivation of employees and achieving positive returns for (an organization with a manager) and an employee with a customer. On the level of an organization, it achieves competitive advantage, knowledge inventory, increases the level of productivity and speed in finalizing tasks effectively.

further found out in their study findings that there is a effectiveness and empowerment of employees' performance. significance for delegation of authority on efficiency,

4.5 Correlation Analysis

Table 3: Correlation Analysis

		Performance of Academic Staff in TTTI	Training	Career Development	Employee Empowerment
Performance of Academic Staff in TTTI	Pearson Correlation Sig. (2-tailed)	1.000			
	N	95			
Training	Pearson Correlation Sig. (2-tailed)	.511**	1.000		
	N	95	95		
Career Development	Pearson Correlation Sig. (2-tailed)	.442**	.264	1.000	
	N	95	95	95	
Employee Empowerment	Pearson Correlation Sig. (2-tailed)	.516**	.251	.495	1.000
	N	95	95	95	95

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

The findings revealed that there is a statistically significant and strong positive relationship between employee empowerment and performance of academic staff at TTTI (r=0.516, p=0.001<0.05), and there is statistically significant and strong positive relationship between training and performance of academic staff (r=0.511, p=0.001<0.05). Similarly, there is a statistically significant and stronger positive relationship between career development and performance of academic staff (r = 0.422, p=0.001<0.05).

4.6 Regression Analysis

The researcher conducted regression analysis to determine the statistical relationship between the variables. For this case multiple regression was used since more than two independent variables were involved (Kothari, 2004). The study conducted multiple regression analysis so as to establish whether human resource development practices had an effect on Performance of Academic Staff in TTTI. This section explains the linear

regression model results that were obtained from the SPSS model. The linear regression model is of the form;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

Where Y is the dependent variable that is performance of academic staff

β_0 is the constant

$\beta_1, \beta_2, \beta_3$ is the slope of each independent variable

X_1 , Employee training

X_2 career development

X_3 employee empowerment

e error term

The model is presented in the table below

Table 4: Regression model

Model	R	R Square	Adjusted R Square
1	.838	.702	.692

a. Predictors: (Constant), Training, Career Development and Employee Empowerment.

b. Dependent Variable: Performance of Academic Staff at TTTI.

The value of R^2 is 0.702. This implies that, there was a variation of 70.2% on performance of academic staff at TTTI with training, career development and employee empowerment. The 29.8% remaining implies that there are other factors not studied in this research that affected performance of academic staff at TTTI.

V. CONCLUSIONS

5.1 Conclusions

After reviewing literature and carrying out empirical study in this research it was concluded that there is significant positive relationship between training, career development and employee empowerment on performance of academic staff at TTTI. The study concluded from the regression findings that, employee empowerment contributed more to the performance of academic staff at TTTI followed by training and then career development. The study concluded that supervisors in TTTI did not identify and address to the employee's training needs at the end of the year indicating gaps in performance. The study concluded that short term training programs is a contributing factor towards job performance of academic staff in TTTI. The study also concluded that performance of academic staff was not impacted with long term training programs provided by TTTI. This can be attributed to the fact that there was no guarantee that training employees actually benefit from long term training since they are on sabbatical leaves and actually not teaching in their respective classes.

It was possible to conclude from the study findings that academic staff in TTTI would perform better if they have an equal chance of making it to the top through career advancement, similarly performance will improve if provided with coaching programs. From the study finding, it can be deduced that promoted staff can produce more quantitative and qualitative work since their attitudes to work are improved. The study concluded that there was positive relationship between career counseling opportunities provided by the employer and performance of academic staff at TTTI.

From the study, it can also concluded that through delegation academic staff level of performance would improve. This could be attributed to the fact since they have added responsibilities employees tend to feel empowered and motivated to perform their job effectively and have a room to be more innovative hence improved performance. Similarly, the study concluded that academic staff in TTTI will perform better if they have a lot of power and control over how they do their job and allowed to make decisions on their job undertakings. Further, the study concluded that knowledge sharing has positive influence

on performance of academic staff in TTTI because the more they know, the better they can perform.

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AUTHORS

First Author – Leah Nyambura Kariuki, MSC HRM, Candidate (Jomo Kenyatta University of Agriculture and Technology) P.o Box 105-60103 Runyenjes, Kenya

Second Author – Dr. Susan Wekesa, Department of Entrepreneurship, Technology, Leadership and Management Jomo Kenyatta University of Agriculture and Technology, P.o Box 62000-00100 Nairobi, Kenya

Effect of Bulky Groups of PAH on Organic Hydrocarbon Contamination Detoxification

Ekwuluo M. O.¹, Ebiana C. A.², Udom G. J.³ and Osu C. I.⁴

^{1,3,4} Institute of Natural Resources, Environment and sustainable Development, University of Port Harcourt, Nigeria.

² Department of Chemistry, Rivers State University, Port Harcourt, Nigeria.

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Abstract- A careful observation of the degradation pattern of PAH with remediation techniques revealed that larger groups pose great resistances to degradations.

The study highlights the photo-Fenton type degradation of polycyclic Aromatic Hydrocarbons (PAHs) using starch stabilized magnetic Nano-particles (SSMNPs) and magnetite (Fe₃O₄) in place of iron II in a Fenton reaction (control experiment). The degradation occurred with respect to size of PAH molecules, number of double bonds present in PAH, and type of PAH molecules. The magnetic nanoparticles were synthesized via-co-precipitation reaction of iron III and iron II chlorides with varying weights of starch at 0.00, 0.02, 0.04, 0.06, 0.08 and 0.10g of MNPs and SSMNPs for the zero (0.00g) starch and starch coated samples respectively. A mixture of 2.0ml crude oil, 8.0ml H₂O₂, 10.0ml H₂O and 0.5g of each of the samples were exposed to sun light for fifty hours. Two other samples of crude oil with H₂O₂ and water only were also exposed along with the listed samples. The samples were then characterised after exposure using the GC – FID model HP 5890 series II. The results obtained showed PAHs concentration as 5.3, 7.4, 7.2, 7.1, 7.0 and 6.7 for the MNPs and SSMNPs samples respectively. The PAHs of the control (Fenton reaction) crude oil with water plus H₂O₂ and crude oil only obtained were 7.9, 8.3 and 29.7mg/l respectively. Observation reveals that PAHs with lower molar mass and fewer double bonds were easily degraded relative to those with higher molar masses and many double bonds.

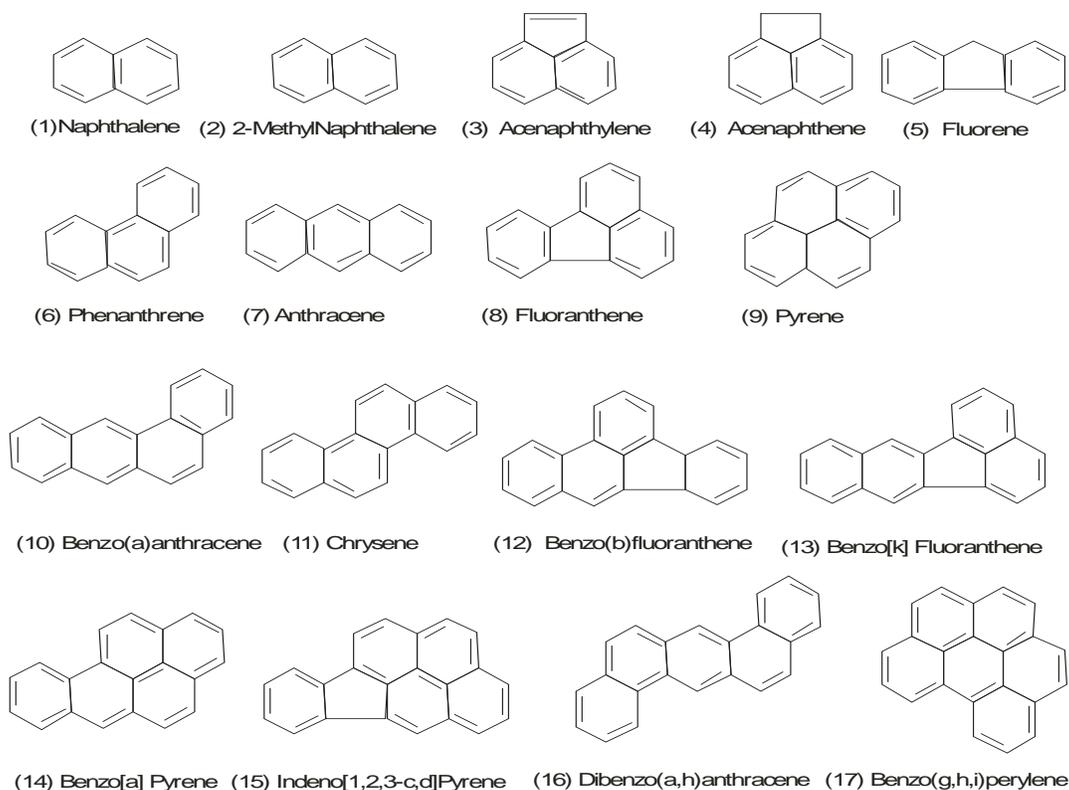
Index Terms- Fenton degradation, Synthesis, Nanoparticles, Concentration, Magnetite, Polycyclic hydrocarbons, Reactions, Bulky groups.

I. INTRODUCTION

The production of viable inorganic reactants of Nano-scale capable of degrading polycyclic aromatic hydrocarbons (PAHs) and monitoring the rate of detoxification with the number of double bonds (π – bonds) in a molecule is the most

relevant issue in this study. ⁽¹⁾ PAHs are organic compounds of 2-6 fused rings of benzene nucleus with molecular mass ranging from 128g/mol in naphthalene to 278g/mol in indenopyrene⁽²⁾. PAHs are components of fossils fuels (petroleum or coal) which seep into the soil or water (surface or ground water) through combustion, oil spillage and drill cuttings⁽³⁾.

Their presence in the environment is of great concern to humanity because they are potential health hazards (carcinogens). Therefore, the reduction of PAH to harmless or environmentally friendly forms is of top most interest to all players of the oil and gas industries^(3,4). Many biological and chemical methods have been used for PAH degradation; these include phytoremediation, bioremediation and chemical remediation. Chemical remediation could involve the use of fertilizers, photooxidation and Fenton reagents etc⁽⁵⁾. Majority of the chemical methods are expensive, less effective and toxic⁶. Fenton's reagent which consists of Fe²⁺ and H₂O₂ are more environmentally friendly with subtlety than other chemical methods. Fenton's reagent has been applied in the remediation of crude oil contaminated soil and water samples^(6,7,8). The substitution reaction of Fe²⁺ with magnetite (Fe^{II}, Fe^{III} species) in a catalysed chemical oxidation appears to be potentially active than Fe²⁺ alone. Such reagent is called Fenton-type reagent⁽⁹⁾. Precipitation of magnetite nanoparticles with different sizes was achieved through coating with varying percentage concentrations of starch⁽⁹⁾. The use of magnetite with varying starch concentration in the degradation of spilled oil has not been reported⁽¹⁰⁾. This research therefore seeks to apply starch stabilized magnetic nanoparticles (SSMNPs) in the degradation of PAHs of spilled oil exposed to sunlight⁽¹⁰⁾. It would be expected that the rate of degradation could be manipulated with starch coatings to such an extent that greater efficiency is achieved. Degradation rate was expected to follow a pattern that as the number of double bonds increase, the rate of degradation decreases⁽¹¹⁾.



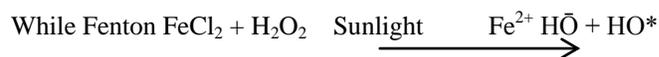
II. METHODOLOGY

Chemicals used were obtained from BDH Analar Ltd, Poole, England. The salt was purchased from a Chemical sales outlet in Port Harcourt, Nigeria.

0.7m NaOH was prepared by dissolving 7.0g of the pellets into 250ml of deionised water. Each mass of 0.02g, 0.04g, 0.06g, 0.08g and 0.10g of starch solution was dissolved into 100ml deionised water. Out of this, 61ml of starch solution was used to dissolve Fe^{2+} and Fe^{3+} hydrated chloride. The mixture was infused in nitrogen gas for ten minutes and shaken gently. To facilitate precipitation of magnetite, 143ml NaOH was added drop wisely to 61ml solution of the Fe^{2+} and Fe^{3+} as a mixture. After the precipitation of the magnetite, filtration was done through a Buckner funnel and was filtered using a vacuum pump. The magnetite was dried in an ovum until the crystals became strong.

III. REACTIONS

The Fenton type is a combination of magnetite (Fe_3O_4) and hydrogen peroxide H_2O_2 in the presence of UV radiation



Fenton

8ml H_2O_2 + 2ml crude oil + 0.5g SSMNP + 10ml H_2O – to make a slurry. Each of the 10 slurries were transferred into a conical flask and exposed to sunlight (IIV light) for 50 hours. The samples were taken for characterization and analysis in GC-FID mode HP 58090 series II.

IV. DATA PRESENTATION

Results of GC-FID are hereby presented as analysed. Table 1 shows the total signal count as obtained. The signal count was directly proportional to the concentration of constitutions in the vapour phase.

Table 1: Table 1: Total signal count of PAH in the samples.

Total PAH in the samples.

	1	2	3	4	5	6	7	8	9	10
	0.02 SSMNP	0.4 SSMNP	0.06 SSMNP	0.08 SSMNP	0.10 SSMNP	MNP+Crude +H ₂ O ₂ +H ₂ O	Fe ²⁺ +H ₂ O ₂ + Crude	Crude H ₂ O ₂ (exposed)	Crude + H ₂ O ₂ (dark)	Crude oil
Naphthalene	0.0	0.0	0.0	0.0	0.0	0.00120	0.0	0.0	0.0	0.64496
2.Methyl Naphthalene	0.0	0.0024673	0.003131	0.00489	0.0073694	0.0	0.0	0.0118328	0.0	0.139196
Acenaphthylene	0.0427658	0.101149	0.0981817	0.109408	0.0982450	0.0415888	0.0624836	0.192043	0.0929269	0.830863
Acenaphthlene	0.0352772	0.68476	0.652298	0.0734941	0.0258336	0.0153664	0.0516715	0.126491	0.0710564	0.350980
Fluorine	0.349822	0.375122	0.156692	0.388679	0.150263	0.111861	0.380491	0.639776	0.266153	0.822233
Phenathrene	0.154867	0.890924	0.114934	0.108828	0.288689	0.539167	0.730630	0.941200	1.00762	0.513217
Anthracene	0.143929	0.107088	0.293870	0.0604345	0.498458	0.259563	0.416004	0.510786	0.675475	2.46836
Fluoranthene	3.39596	3.48993	2.80756	2.90314	2.11843	0.507891	0.748927	0.846853	4.11410	11.02290
Pyrene	0.146636	0.184032	0.0900955	0.239152	0.26599	0.153844	0.542410	0.513164	0.303787	1.14129
Benz (a) anthracene	0.192712	0.334427	0.551218	0.53959	0.364707	0.201125	0.221320	0.238425	0.735564	1.67016
Chrysene	0.503380	0.294974	1.15166	0.757463	0.273578	0.664790	1.29277	0.436932	1.19958	2.80554
Benzo (b) fluoranthene	0.813206	0.295529	0.313277	0.2549	0.2676763	0.085696	0.290618	1.04341	0.491517	0.992418
Benz (k) Fluoranthene	0.200494	0.614580	0.482582	0.537924	0.554790	0.140454	0.255184	0.267061	0.812327	3.01070

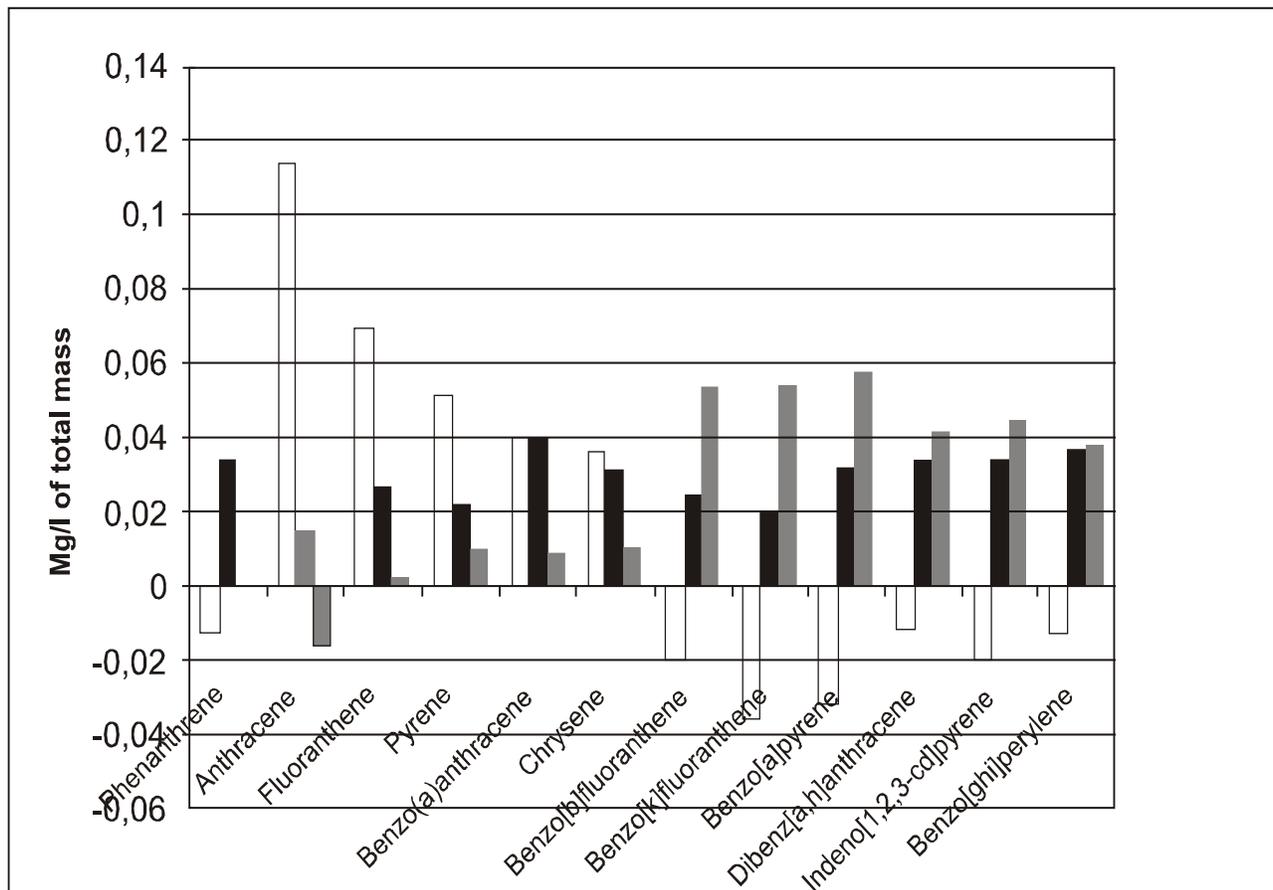


Fig 1: Graphical display of all PAHs

The tallest peaks were those of crude oil sample as expected due to high concentration and absence of catalyst $H_2O_2^{(11)}$ However, few PAHs in the crude oil were degraded even lower than those of other samples. For example, acenaphthene and benzo (a) pyrene peaks of crude oil sample were lower than 0.02% SSMNPs and even MNPs respectively

PAH Degradation due to Molar Mass and π – Bonds of Benzene Nucleus

The table above shows GC – FID was not able to detect 2 – member rings of Naphthalene for samples of FL 1-5. The four rings member of pyrene and fluoranthene with molar mass 202g resisted photochemical oxidation. There values were 0.15ppm

and 0.50ppmm. This must have been due to their large molecular mass and ring number of 4.

Degradation rate of PAH Relative to Double bonds and Molar Mass.

Observed resistance to degradation is likely due to the number of double bonds as well as the molar mass of each compound. Five double bonds in naphthalene were easily degraded by Fenton and Fenton type. The trend was slow at higher numbers like Pyrene and Benzo pyrene of nine and eleven double bonds respectively.

Table 2: Degradation rate of PAH Relative to No. of bonds and Molar Mass.

PAH	Rings Group	Molar MASS	Degradation pt after 50hrs ppm
Naphthalene	2	128	0.00
Acenaphthylene	3	166	0.10
Anthracene	3	178	0.06
Phenanthrene	3	178	0.08
Fluorene	3	166	0.37
Pyrene	4	202	0.180
Benzo (a) Anthracene	4	228	0.33
Chrysene	4	228	0.29
Dibenzo (a,h) anthracene	5	278	0.18

V. DISCUSSION

Degradation of PAHs was higher with the lower members of the compounds. These are Naphthalene, 2. Methyl Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene and Anthracene. Those higher members with very high molecular mass number were more resistant to degradation; however, degradation is feasible with strong oxidizing agents like the Fenton's and Fenton type. The number of double bonds in PAHs compounds is also a factor that could be considered. Benzo(a)pyrene, Indeno (1,2,3-c, d) pyrene with many pi-bonds showed resistance to degradation while Naphthalene did not considerably resist degradation.

VI. CONCLUSION

The size of a molecule of PAH plays significant role in resistance to its degradation. Most advanced methods of remediation's like Fenton, Fenton type are only useful in degrading higher members of PAHs. Therefore, the study recommends the chemical remediative methods strongly for effective and complete clean-up of any polluted environment (soil or ground water).

Nanoparticles have proved very active in the remediations of hydrocarbon polluted environment. Modern improved methods of Fenton type are most useful in remediating a large polluted environment. The MNPs and SSMNPs could indeed be used as heterogeneous catalyst in reactions in order to attain best

results in remediations and other environmental clean ups. The larger members of the PAHs offered resistances in degradation. Therefore, bulky groups of PAHs with many double bonds with its associated resonance stabilized benzene nucleus of the kekule's structure are the results and opposition to environmental purity.

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AUTHORS

First Author – Ekwuluo M. O, Institute of Natural Resources, Environment and sustainable Development, University of Port Harcourt, Nigeria.

Second Author – Ebiana C. A, Department of Chemistry, Rivers State University, Port Harcourt, Nigeria.

Third Author – Udom G. J, Institute of Natural Resources, Environment and sustainable Development, University of Port Harcourt, Nigeria.

Fourth Author – Osu C. I, Institute of Natural Resources, Environment and sustainable Development, University of Port Harcourt, Nigeria.

Sensory Evaluation of Ashgourd and Amla Based Juice and Soup

Sailaja S¹ and Parameshwari .S²

¹. Department of Clinical Nutrition and Dietetics, Periyar University, Salem-11.

². Associate professor, Department of Clinical Nutrition and Dietetics, Periyar University, Salem-11

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Abstract- Sensory evaluation of food is a growing science, which is of particular interest for typical products such as those having a Ash gourd and Amla based Juice and Soup. This manuscript will concentrate mainly on two products: (a) Juice and (b) Soup. The main objective of the study was to analyse the sensory scores of the various samples of the juice and soup rank the different samples according to their sensory qualities, using statistical analysis. The general sensory attributes colour, flavour, aroma and taste were also ranked according to their importance in the overall acceptability of the drinks etc. The product was judged as the first in ranking and 'taste' as the best quality attribute. These implicate the importance of sensory evaluation in identifying consumers' preferences and also the competency of statistic approach in decision making.

Index Terms- Developed product, Ash gourd juice and soup and sensory evaluation.

I. INTRODUCTION

Sensory evaluation is one of the methods used in identifying the market acceptability especially in food or drink based products. It is useful for product development and improvement since the most important factor for a particular market can be identified and improved [1], [2]. Influential factors are essential for consumers to get the best product and for manufactures to develop and sell the best product. Sensory evaluation is also necessary to ensure that their products will be succeeding in the marketplace. Sensory analysis is too commonly often overlooked as a requirement before product launched. The implications again back to the successfulness of products to survive in market. Today's consumers are discerning, demanding and more knowledgeable about food and expect products which are safe, good value and of high sensory quality.

Ash gourd is grown throughout India and found in both cultivated and non-cultivated lands and genetic variability is present for fruit shape, size, days to flowering, wax deposition and other vegetative characters. Chhattisgarh state has good genetic diversity for various characters and no exploration has been taken to trap the diversity. Genetic variability is present especially for fruit characters, days to flowering and days to maturity. In spite of being in cultivation science ancient times and the presence of the wide germplasm had created wide genetic variability for various characters conscious evaluation and exploitation of germplasm has not been given much emphasis till

date. At present there is urgent need to develop early maturing high yielding variety possessing desirable processing traits. The genetic improvement of any crop depends upon the available genetic variability for quantitative traits and its judicious exploitation through efficient breeding methods (Cruess, w.v,1958). Amla is highly acidic and astringent in taste due to which they are unpalatable and unsuitable for direct consumption. The excellent nutritive value and therapeutic value of the amla fruit offers an untapped potential for processing into several quality products. Hence, they are consumed mainly in the processed forms (Gudapaty et al., 2010). Amla fruit is processed into murabbas, candy, dried chips, jelly, squash and syrup (Barwal et al., 2010). To make amla a fruit of mass, products need to be developed which are attractive, tasty and which can be consumed as food items, but at the same time retain its nutritive and therapeutic values (Pathak, 2003).

In the present study objective was overall acceptability of a beverage based on juices and soups, which aggregated the sensory evaluation of juice and soup with the higher vitamin content of together with the bioactive components of both raw materials. Response surface methodology (RSM) was used to model the sensory acceptability response of consumers, to generate a predictive equation with the variables studied.

Objectives

- To standardize the procedure for preparing juices and soups from the selected samples.
- To develop the Ash gourd and Amla based juice and soup by using different variations.
- To assess the sensory evaluation of the formulated juices and soups.

II. MATERIALS AND METHODS

1.1. Procurement of Raw Materials

The Raw Materials were procured from the local market namely Ash gourd, amla, sugar, potato, ginger, tomato, pepper and binders and corn starch) and otherspices in the Salem market, Tamilnadu

1.2. Location of the study

The study was conducted in the department of clinical nutrition and Dietetics at Periyar University, Salem, Tamilnadu

1.3. Standardization of Juice and Soup samples

Standardization was done by blending ash gourd, amla and ginger juice and soup in different quantities.

The steps for the formulation and processing of ash gourd and Amla based juices and soups were discussed. The standard procedures used for product development is mentioned in Table 1 & 2.

Table -1
Ash gourd and Amla based Juices

S. No.	Juices (variations)	Ingredients	Method
1	Variation-1	Ash gourd juice-300ml, Amla juice-40% Ginger juice-5% Sugar-45%	Take required quantity of juices from the extraction of Ash gourd , Amla and ginger then blend all the above three juices add sugar and cardamom for taste and mixed well till the sugar dissolved & serve cold
2	Variation-2	Ash gourd juice-400ml, Amla juice-50% Ginger-5%, Sugar-60%	

Table-2
Ash gourd and Amla based Soups

Ingredients	Method
Ash gourd juice-300ml, Amla juice-20% Ginger-2% Onion-30% Potato-30% Tomato-15% Corn starch-10%	All ingredients are washed and cleaned then Cut into small pieces and remove damaged portion. the above mentioned ingredients with 150ml of water and pressure cook for 10-15min. Mash the cooked ingredients and filtered and add corn flour, salt and chilli powder boil for 5 min and serve hot
Ash gourd juice-400ml Amla juice-20% Ginger-2% Onion-40% Potato-40% Tomato-20% Corn starch-10%	

1.4. Sensory Evaluation

Sensory evaluation was conducted for all the standardized juice and soup samples and also for best accepted samples selected by trained panel members using 5 point Hedonic scale. The beverages were prepared in the Department of clinical Nutrition and dietetics, Periyar University, Salem. The two types of juice and soup were first standardized at different levels. This procedure for attribute development was parallel to that used in some other recent sensory studies (Vara-Ubol et al. 2004; Matta et al. 2005; Chambers et al. 2006).

The samples were then given to the panellists with an evaluation form. They were asked to taste one sample at a time, and record their responses allowing time between samples so that

the tasters can record their opinion. Two variations of each juices and soups were made. The composition of the different beverages was subjected to sensory evaluation as presented in Table 3 & 4.

III. RESULT AND DISCUSSION

The data generated from the performs of sensory scores were statistically analysed using the values are expressed as Mean ± SD (Standard deviation) were executed with SPSS software (version 11.5) on descriptive analysis of Juices and Soups , while the hedonic ratings of the juice and soup quality were used for evaluating the consumer preference on texture, overall characteristics and purchasing decision.

Ash Gourd and Amla based juices and soups were evaluated by the paired preference, hedonic rating and multiple comparison tests using 20 semi-trained assessors for sensory evaluation. The average values for overall acceptability and statistical method are presented in Table 3. The standard deviation was within the expected range since each assessor judged the samples according to his own expectations with respect to the beverages.

Hedonic rating scale method was adopted to estimate the acceptance of the products totally 20 untrained responding were used for sensory analysis.

1.5. Statistical Analysis of Juices

Table-3
Statistical analysis in Different Variations of juices

S. no	Criteria (Sensory evaluation)	Juice (variation-1) Mean ± S.D	Juice (variation-2) Mean ± S.D
1	Appearance	4.30 ± 0.73	4.75 ± 0.44
2	Colour	4.35 ± 0.65	4.50 ± 0.51
3	Flavour	4.40 ± 0.68	4.30 ± 0.57
4	Consistency	4.25 ± 0.55	4.35 ± 0.48
5	Aroma	4.40 ± 0.68	4.70 ± 0.47

The above table depicts the sensory criteria of juice (variation-1) has the Mean and SD value was obtained to the appearance 4.30 ± 0.73, colour- 4.35 ± 0.65, flavour - 4.40 ± 0.68, consistency - 4.25 ± 0.55 and aroma - 4.40 ± 0.68.

The above table depicts the sensory criteria of juice (variation-2) has the Mean and SD value was obtained to the appearance 4.75 ± 0.44, colour- 4.50 ± 0.51, flavour - 4.30 ± 0.57, consistency - 4.35 ± 0.48 and aroma - 4.70 ± 0.47. Based on the

sensory evaluation of soup , soup-2 was highly accepted by the selected panel Member.

Figure-1
Comparison of hedonic rating scale for different variations in juices

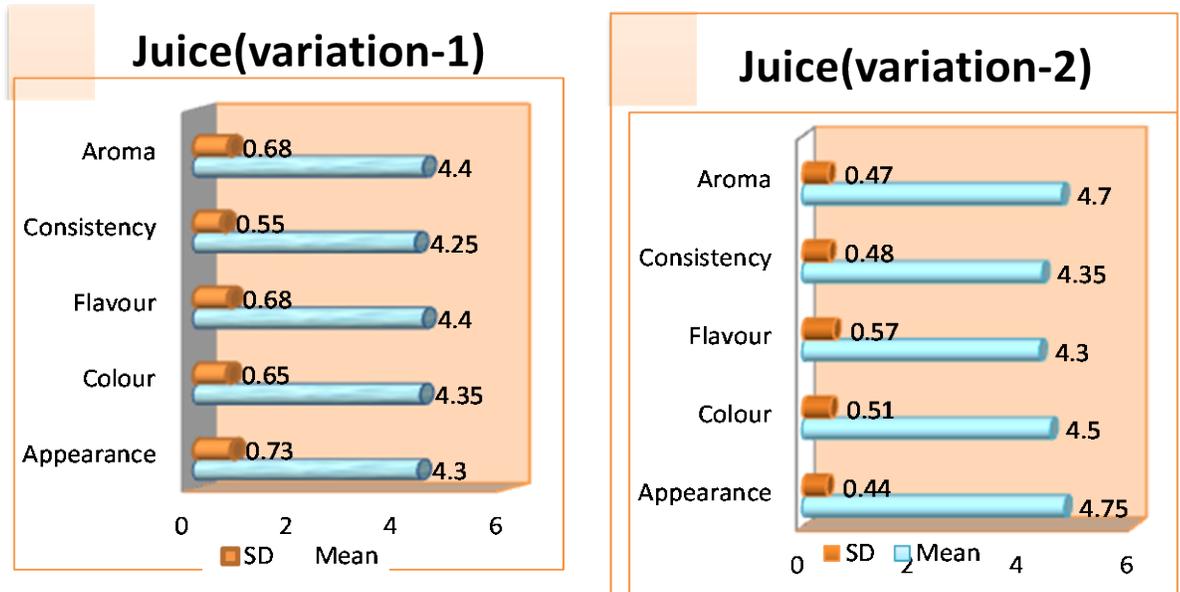


Table-4
Statistical analysis in Different Variations of soups

S. no	Criteria (Sensory evaluation)	Soup (variation-1) Mean ± S.D	Soup (variation-2) Mean ± S.D
1	Appearance	4.45 ± 0.51	4.45 ± 0.68
2	Colour	4.35 ± 0.67	4.50 ± 0.82
3	Flavour	4.25 ± 0.49	4.35 ± 0.74
4	Consistency	4.40 ± 0.75	4.55 ± 0.75
5	Aroma	4.35 ± 0.67	4.30 ± 0.73

The sensory evaluation of different variations of juices showed in the above table, that the content of aroma, consistency, flavour, colour, appearance was highly present in Variation-2 juice.

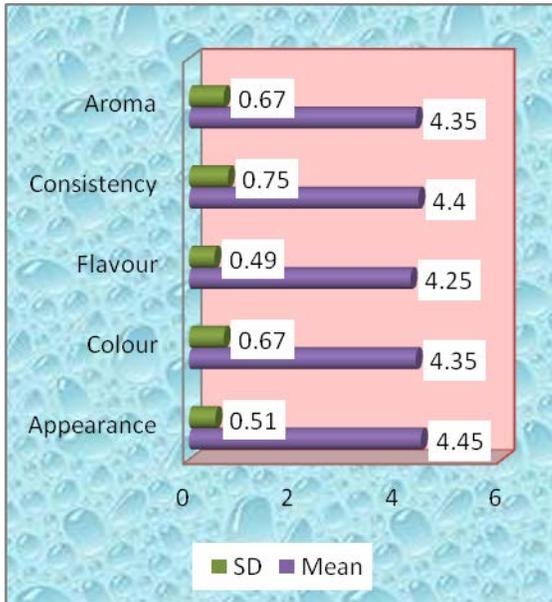
The above table depicts the sensory criteria of soup (variation-1) has the Mean and SD value was obtained to the appearance - 4.45± 0.51, colour- 4.35 ± 0.67, flavour - 4.25 ± 0.49, Consistency - 4.40± 0.75 and aroma - 4.35 ± 0.67.

The above table depicts the sensory criteria of soup (variation-2) has the Mean and SD value was obtained to the appearance 4.45 ± 0.68, colour- 4.50 ± 0.82, flavour - 4.35 ± 0.74, Consistency - 4.55 ± 0.75 and aroma - 4.30 ± 0.73. Based on the sensory evaluation of soup (variation-2) was highly accepted by the select panel member

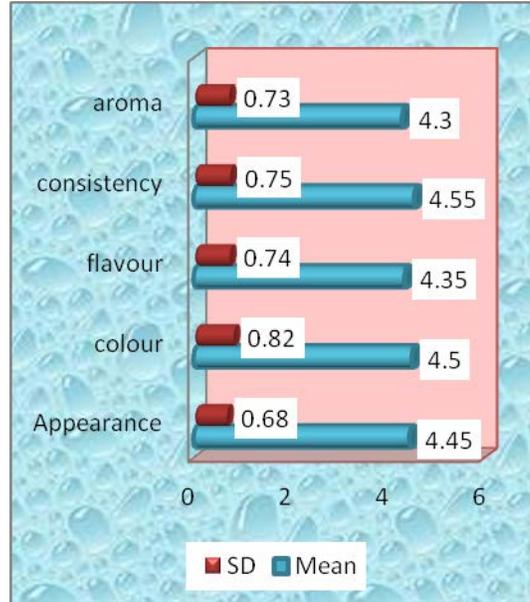
Figure-2

Comparison of hedonic rating scale for different variations in soups

Soup(variation-1)



Soup(variation-2)



The sensory evaluation of different variations of soups showed in the above table, that the content of aroma, consistency, flavour, colour, appearance was highly present in Variation-2 soup.

IV. CONCLUSION

A list of 20 descriptors suitable to profile fresh juices and soups were generated and used to evaluate the performance of a group of panellists with good experience in sensory analysis. This work has shown that the locally available vegetable juices and soups contain safe level of sensory evaluation for human consumption. Consumers bought juice and soup due to its taste and nutrients. Simultaneously, they also contain higher health benefits from juices and soups as well. The beverage produced by the improved processing method for a juice-2 and soup-2 has more acceptable quality attributes than the juice-1 and soup-1 from the traditional processing method and is considerably cheaper than similar products from conventional sources.

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AUTHORS

First Author – Sailaja S, Department of Clinical Nutrition and Dietetics, Periyar University, Salem-11.

Second Author – Parameshwari .S, Associate professor, Department of Clinical Nutrition and Dietetics, Periyar University, Salem-11

Corresponding Author: Dr.S.Parameshwari, Associate professor, Email: sparameshwari2009@gmail.com

Analysis of the Performance Improvement of Agricultural Owners in the Development of Bali Cow Business in Paser Regency (Case Study: Long Ikis District)

Abdul Rachim, Taufik Hidayat and Hamdani

Agriculture Faculty, Lambung Mangkurat University, Banjarbaru, South Kalimantan, Indonesia

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Abstract- This study aims to determine the performance of agricultural extension workers, know the success of farmers, analyze the relationship between the performance of agricultural extension workers and the success of farmers and analyze the relationship of each factor: knowledge, skills, motivation, attitudes, facilities and distance of residence with the performance of agricultural extension workers in the development of livestock bali cattle in Long Ikis District, Paser Regency.

This research was carried out from October 2017 to February 2018 in the Long Ikis Subdistrict of Paser Regency, East Kalimantan, with consideration of having the most potential development of Bali cattle among the districts in Paser Regency, thus supporting this research. This research is a case study, with a sample of 96 farmers and 16 agricultural extension workers. The analysis method used in this study is scoring, validation and reliability analysis.

The results showed that the performance of agricultural extension workers was less successful both from the nature of personality, namely; perseverance, discipline, hard work, responsibility, and example and the results are; frequency of extension workers, instructor materials, extension programs, changes in behavior and development in the development of bali cattle business. The success of the breeders can also be said to be less successful can be seen from weight gain, decreased mortality, knowledge of farmers, number of ownership, handling of diseases, capital and marketing. To relate the performance of agricultural extension workers to the success of farmers at 0.783 or have a real positive relationship, while the relationship between the performance of agricultural extension with supporting factors is; for knowledge of 0.652 or have a real positive relationship, skill is 0.697 or has a real positive relationship, motivation is 0.525 or has a real relationship, attitude is 0.508 or has a real relationship, distance of residence is 0.689 or has a real positive relationship and facilities are not significantly related because the value is the same.

Index Terms- performance improvement, agriculture extension

I. INTRODUCTION

Bali cattle farm, Long Ikis District, Paser District, East Kalimantan is one of the most important sectors in the economy in this area, because livestock business is also one of the main providers of income for farmers and employment for some Paser District residents. With the effort to develop bali cattle breeding, it is expected to be able to expand employment opportunities and improve the welfare of farmers in accordance with the law of the Republic of Indonesia Number 41 of 2014 concerning livestock and animal health.

The high and low performance of agricultural extension workers will have an impact on the success of farmers in developing bali cattle business. The success of farmers includes: (a) increasing weight gain of Balinese cattle; (b) a decrease in the percentage of Bali cattle deaths; (c) increasing the number of ownership scales of Bali cattle business; (d) implement appropriate technology; (e) able to control disease in Bali cattle; (f) able to make cages that meet the requirements; (g) able to find capital to increase its business; (h) able to market their livestock; (i) and is able to increase its income in accordance with the regulation of the Minister of Agriculture No. 91 / Permentan / OT.140 / 9/2013 concerning Guidelines for Evaluating the Performance of Agricultural Extension. Therefore, the study of "Improving the Performance of Agricultural Extension in the Development of Bali Cattle Business in Paser District (Case Study: Longikis District)"

1. Formulation of the problem

Based on the background above, it can identify several problems in this study:

1. What is the performance of agricultural extension workers in the development of farmers' businesses?
2. What is the success of farmers in developing the breeder business?
3. How is the relationship between the performance of agricultural extension workers and the success of farmers in developing the farmer business?
4. What is the partial relationship between knowledge, skills, motivation, attitudes, distance of residence, and

facilities with the performance of agricultural extension workers in the development of breeder business?

2. Research purposes

Based on the problems stated above, this research has the following objectives:

1. Knowing the performance of agricultural extension workers in the development of farmers' businesses.
2. Knowing the success of farmers in developing farmer businesses.
3. Analyzing the relationship between the performance of agricultural extension workers and the success of farmers.
4. Analyzing the relationship of each factor: knowledge, skills, motivation, attitudes, facilities and distance of residence with the performance of agricultural extension workers in the development of breeder businesses.

3. Benefits of research

Based on the research objectives stated above, this study has the benefits of:

1. For extension workers, so they can introspect and then provide input and consideration to the local government about the performance of agricultural extension agents in the development of livestock businesses
2. For breeders, in order to increase knowledge about the development of Bali cattle business in the Long Ikis District of Paser Regency, it is hoped that it will motivate to be more active and serious in developing Bali cattle business.
3. For students, in order to increase knowledge about the performance of agricultural extension workers in the development of Bali cattle business in the District of Long Ikis Paser Regency.

II. RESEARCH METHODS

1. Planning

The research was carried out in October 2017 to February 2018. This research was carried out in the Long Ikis Subdistrict, Paser Regency, East Kalimantan, where the sub-district was one of the biggest places for developing Bali cattle business.

2. Data Collection Method

Collection is done with primary and secondary data. Primary through questionnaire with respondents while secondary data uses references in the form of related institutions and other literature.

3. Sampling Method

The choice of this location was determined by using the purposive sampling method which is a method of determining the location / research sample based on certain considerations (Soekartawi, 1995).

Respondents for farmers used in this study were determined proportionally, which was taken 10% of each village studied. The number of samples is determined based on the Slovin formula (Consuelo, 1993).

4. Data analysis method

Variable measurement

To be able to take a conclusion from the data obtained in data processing descriptive method is used.

Data regarding the variables of performance, knowledge, skills, motivation, distance of residence, agricultural extension facilities and farmer success are measured on a five-level scale (1,2,3,4,5). This scale uses five categories of answers for each question that is compiled. Each answer is scored consistently.

Acquisition of total agricultural extension performance scores, knowledge, skills, motivation, attitudes, distance of residence, facilities and success of farmers in Bali cattle business are presented in percent (%) based on the ideal maximum score (Singarimbun and Effendi, 1989). To find out the value values of performance, knowledge, skills, motivation, attitudes, distance of residence, agricultural extension facilities, and success of farmers, each category can be seen from the percentage of achievement scores using the Class Interval formula proposed by Dajan (1986). By using the class interval formula, you can know the category value for each variable as follows. For performance categories, knowledge, skills, motivation, attitudes, agricultural extension facilities and the success of each farmer are grouped.

The relationship between the performance of agricultural extension workers and the success of farmers and the relationship between knowledge, skills, motivation, attitudes, distance of residence, and agricultural extension facilities with the performance of each agriculture instructor was tested using the Spearman level correlation coefficient test. Spearman level correlation is usually also called tiered correlation (r_s) its usefulness is to measure the degree of closeness of the relationship between two variables or independent variables with the dependent variable ordinal scale (Riduwan, 2010).

Validity test

Validity indicates the extent to which a measuring device measures what you want to measure according to the actual size. In this study, the method used to test the validity of a measuring instrument is construct validity, namely the preparation of operational benchmarks of a framework of thinking. The efforts made are as follows: (a) benchmarking based on the frame of mind obtained from several literature studies; (b) consult with supervisors and various parties who are considered to have mastered the material to be measured; (c) making a research questionnaire; and (d) determine the test location. The testing steps are as follows: (a) make a tabulation of scores for each question number for each respondent and (b) test the validity using the correlation formula "Product Moment" (Singarimbun and Effendi, 1995).

5. Reliability test

Reliability shows the extent to which a measuring instrument can be trusted or relied upon in measuring the same symptoms at different times. This is the same as the validity test performed on the same place and respondent. The reliability testing results of measuring instruments use a split technique, which is correlating the answers of the first and second hemispheres.

Split-Half Guttman Reliability Value is $0.756 \geq r$ -table, this indicates that the measuring instrument has high reliability.

The testing steps are as follows: (a) make a tabulation of scores for each question number for each respondent and (b) reliability testing using a simple correlation formula.

III. RESULTS AND DISCUSSION

1. Performance based on the nature of personality

The number of agricultural extension workers used as respondents was 16 people. For the performance of agriculture instructors based on personality traits, that is in the category of "good" as many as 5 people or 31.25% while included in the category of "not good" as many as 11 people or 68.75% with an average score of 65.55 or included in the category "not good". This shows that the performance of agricultural extension workers based on the nature of personality needs to be increased to a higher level in order to produce better performance in the future.

2. Performance based on results

Agricultural extension workers have a performance based on results in the category of "unfavorable" as many as 13 people or 81.25% while including the category of "good" 3 people or 18.75% with an average score of 62.77 which is included in the category "not good". This shows that the performance of agricultural extension workers based on results is still in the unfavorable category. Thus the need for performance based extension workers needs to be increased to a higher level in order to produce better performance. Detailed data about the performance of agricultural extension workers based on the results of the study.

Overall the performance of the instructor is in the category of "good" as much as 2 people or 12.50% while the category of "poor" is 14 people or 87.50%. The average achievement of agricultural extension performance scores is 63.91% including performance in the "poor" category. This shows that instructors with performance are expected to improve their performance for the success of farmers

The performance of agricultural extension workers in good category is innovative, creative, attendance of participants, the interaction of extension workers with breeders and management of bali cattle breeding business, while those that are less well categorized are diligent, disciplined, hard work, responsible, exemplary, counseling material, probahan breeders behavior and the development of bali cattle breeders. Performance that is categorized as not good is the frequency of the extension agent. Details of complete data regarding the elements of agricultural extension performance.

From the results of the analysis it was found that the average achievement of the performance of agricultural extension workers based on the nature of personality is 65.55% of being included in the unfavorable category. This is due to the lack of perseverance, discipline, responsibility and exemplary that must be possessed by agricultural extension workers. Because the component refers to the overall output of work or activities that must be carried out in the framework of a job.

Agricultural extension workers who have long working hours will be able to produce good performance in the development of bali cattle breeding business. Forms of work that must be carried out by agricultural extension workers in this area

are motivating farmers to be able to achieve success in bali cattle breeding business, guiding farmers in maintaining Bali cattle, guiding farmers in applying technology, and providing information to farmers about a good Bali cattle marketing system.

Responsibilities that must be possessed by agricultural extension agents in this area are that agricultural extension workers try their best to find solutions to problems that are always faced by bali cattle farmers, helping Bali cattle farmers in facilitating farmers in terms of needing the necessary production facilities, and trying to motivate bali cattle farmers to be serious in carrying out the counseling material that has been given.

Exemplary is an important factor also to improve the performance of agricultural extension workers in this area. The nature of the negligence that is owned by agricultural extension workers in the research area is not good and will have an impact on the motivation to motivate farmers to do more advanced in the bali cattle breeding business that is not good. The exemplary form that should be owned by agricultural extension officers is always to set a good example in raising Balinese cattle, hard work, self-confidence, the desire to move forward in a better direction, and always be on time in carrying out tasks.

But agricultural extension agents in this area must have good innovative qualities. The form of innovative traits carried out by agricultural extension agents is that they always apply the new technology needed by Balinese cattle farmers. The new technology applied by agricultural extension workers in this area is artificial insemination, how to control Bali cattle disease, and a good marketing system for Bali cattle breeding business. The application of this new technology is done because most of the farmers in this area do not use technology that can accelerate the Bali cattle breeding business.

Agricultural extension workers in the region also have good creative traits. Agricultural extension agents always produce new ideas needed by Bali cattle farmers. With these new ideas, farmers will increase their knowledge. Forms of new ideas produced by agricultural extension workers are the provision of bali cattle feed facilities, the use of bali cattle feces into biogas, the use of artificial insemination to speed up the marital process in bali cattle, and provide information to farmers about a good Bali cattle marketing system.

Performance based on results is obtained by the average achievement of agricultural extension performance score is 62.77 and is included in the unfavorable category. This is due to the lack of frequency of agricultural extension workers, extension materials, extension programs, changes in farmer behavior and development to farmers to see the Bali cattle breeding business. According to van den Ban and Hawkins (1999), counseling is the involvement of a person to consciously communicate information with the aim of helping others in giving opinions so that the correct decision is obtained.

Communication and visits of agricultural extension workers to Bali cattle farmers are done once a month. As a result, counseling is not running smoothly and information about the development of Bali cattle business is also hampered. Communication and visits between agricultural extension agents and farmers in this area should be carried out in agricultural extension centers, village halls, in the homes of agricultural extension workers and Balinese cattle farmers.

Agricultural extension officers in this area should be involved in conducting counseling activities for Balinese cattle breeding in advance of extension programs. The preparation of the program was conducted to determine the needs of Balinese cattle farmers. There are several stages in the form of program preparation carried out by agricultural extension workers, namely: (a) the stage of collecting data on the situation / situation; (b) the data analysis stage; (c) the stage of determining needs; (d) the problem formulation stage; (e) goal setting stage; (f) the stage of determining alternatives to achieve goals; (g) the selection stage of the best alternative; (h) the stage of determining the work plan and work calendar; (i) the implementation phase of the work plan; (j) evaluation stage, and (k) reconciliation stage.

The behavior of farmers in this area is that they have not been directed towards more advanced ones. In addition, Bali cattle farmers who still tend to maintain Bali cattle as a side business. The development of Bali cattle breeding business in this area is still relatively slow. This is caused by the majority of breeders who do not fully have a Bali cattle pen as a place to eat and drink, a place to rest, protect Bali cattle from outside animals, protect from strong winds, heat and rain, and provide a sense of security for Bali cattle. In addition, farmers in this area also have a population of Balinese cattle with an average of 5 animals. This illustrates that the number of livestock holdings in this area is not too high.

The performance of agricultural extension workers based on their work is not all categorized as poor, but there are also good categories. For example the interaction between extension workers and good breeders. Farmers always discuss with extension agents about problems in developing Bali cattle business.

Management of Bali cattle farms in this area is also quite good. This is caused by the good management of Balinese cattle business carried out by farmers, and the existence of housing for Balinese cattle.

From the results of the analysis, it was found that the average achievement of the percentage of agricultural extension performance scores was 63.91%, which included the unfavorable category. This shows that agricultural extension workers have not been able to produce good performance in the hope that the success of the breeders in the Bali cattle breeding business will be achieved.

Success of Farmers

Bali cattle breeders As many as 22 people or 22.92% have a category of "unsuccessful" and have a category of "less successful" as many as 34 people or 35.42% and as many as 17 people or 17.71% have the category of "successful" in cattle farming Bali. The average achievement score of breeders in Bali cattle breeding business is 67.05%, including the less successful category. This shows that farmers have not succeeded well in running a Bali cattle breeding business. Complete data details about the success of farmers in Bali cattle business can be seen in Table 1.

Table 1. Success of Farmers in Bali Cattle Farming Business

No	Success of Farmers	Number of Agricultural Extension	
		(person)	Percentage (%)
1	Very Successful	23	23,96
2	Succeed	17	17,71
3	Less successful	34	35,42
4	Not successful	22	22,92
5	Very Unsuccessfu	-	-
Total		96	100

Source: 2017 Primary Data Processing Results

The success of breeders in Bali cattle breeding business which is categorized as less successful are body weight gain, decrease in mortality of Bali cattle, breeders 'knowledge of Bali cattle breeding, number of Bali cattle ownership, handling of diseases, capital and marketing while those that are successful include farmers' income and technology application. Details of complete data regarding the elements of success in the Bali cattle breeding business

Factors allegedly related to the performance of agricultural extension workers in the development of Bali cattle breeding businesses such as knowledge, skills, motivation, attitudes, distance of residence, agricultural extension facilities, and the success of farmers in cattle farming.

3. Relationship between Performance and Success of Farmers

The success of breeders is significantly positive ($P < 0.01$) or close to the value of 1 with the performance of agricultural extension workers in Bali cattle farming, meaning that this research hypothesis is accepted which can be seen in Table 2.

Table 2. Relationship between the Success of Farmers and Extension Workers

No	Correlation Coefficient	
	performance	Successful
1		0,783**

Source: 2017 Primary Data Processing Results

In terms of the nature of personality, this is due to: (a) not being fully diligent in carrying out the task; (b) less discipline that is owned by extension agents; (c) lack of hard work as an agricultural extension agent; (d) lack of a high sense of responsibility; and (e) the lack of exemplary characteristics possessed by agricultural extension agents.

In terms of the work of agricultural extension workers, this is caused by: (a) the frequency of extension workers is classified as not good; (b) the instructor material is not very good; (c) poor extension programs; (d) changes in the behavior of breeders haven't largely led to more advanced behavior; and (e) the development of Bali cattle breeding business is still relatively low. In terms of the success of farmers in the Bali cattle breeding business, farmers in the area are categorized as less successful. From the results of the analysis that the average achievement score is successful

The number of livestock ownership in this area is categorized as unsuccessful. This is caused by Bali cattle in this area rarely increase. Farmers only have the ownership of Bali cattle with an average of 5 heads. With the total ownership of 5 Bali cattle, it will result in a discrepancy between income and workload as a farmer. Farmers in this area rarely pay attention to the need for good feed for Bali cattle. Lack of attention of farmers to the need for this feed, resulting in not increasing body weight gain of Balinese cattle. Bali cattle can grow well, so we need good feed. With the fulfillment of the needs of Bali cattle feed is expected to support the growth and development of Bali cattle.

In capital, farmers in this area do not have the will and ability to borrow capital from banks and cooperatives. This is because farmers do not have the courage to borrow capital. Farmers are afraid of the risk of not being able to repay loans because they do not have the certainty of the success of their farms. Farmers in this area only make capital loans from close family and friends.

In seeking information on the Bali cattle market, farmers in this area sought information on the Bali cattle market through agricultural extension agents, asking for help from friends and family of farmers. This is done because farmers do not have the ability to access marketing.

4. Agricultural extension knowledge

Most 56.25% or 9 agricultural extension workers have the knowledge included in the "high" category, the "less high" category is 5 people or 31.25% while the remaining 2 people or 12.50% have knowledge in the category "Not High" in the development of Bali cattle breeding business. The average achievement percentage of the instructor's knowledge score regarding the development of Bali cattle breeding business is 67.50 or "less high" category.

Table 3. Distribution of Agricultural Extension Based on Knowledge

No	Knowledge	Number of Agricultural Extension	
		(person)	Percentage (%)
1	Very High	-	-
2	High	9	56,25
3	Not high enough	5	31,25
4	Not high	2	12,50
5	Very Not High	-	-
Total		16	100

Source: 2017 Primary Data Processing Results

5. Agricultural extension skills

Agricultural extension workers have skills in the "skilled" category, namely 4 people 25.00% while the skills in the category of "less skilled" are 8 people or 50.00% and 4 people or 25.00% including "unskilled" categories in the development of livestock businesses Bali cattle. The average achievement score of the instructor's skills in the development of Bali cattle breeding business is 60.31% of the maximum score included in the less skilled category.

Table 4. Distribution of Agricultural Extension Workers by Skills

No	Skill	Number of Agricultural Extension	
		(person)	Percentage (%)
1	Very Skilled	-	-
2	Skilled	4	25,00
3	Less Skilled	8	50,00
4	Not Skilled	4	25,00
5	Very Not Skilled	-	-
Total		16	100

Source: 2017 Primary Data Processing Results

6. Motivation of agricultural extension workers

Agricultural extension workers have motivation in the category of "strong" as many as 6 people or 37.50% while having motivation in the category of "less strong" as many as 9 people or 56.25% and 1 person or 06.25% including the category "not strong" in the development Bali cattle breeding business. The average achievement score of the instructor's motivation in the development of Bali cattle breeding business is 64.69% of the ideal maximum score included in the less strong category can be seen in Table 5.

Table 5. Distribution of Agricultural Extension Based on Motivation

No	Motivation	Number of Agricultural Extension	
		(person)	Percentage (%)
1	Very Strong	-	-
2	Strong	6	37,50
3	Less strong	9	56,25
4	Not strong	1	06,25
5	Very Not Strong	-	-
Total		16	100

Source: 2017 Primary Data Processing Results

With motivations that fall into the less powerful category, it is expected to be better able to produce good performance in the future again in the development of Bali cattle breeding business. Details of complete data regarding the motivation of extension workers in developing Bali cattle business

7. The attitude of agricultural extension agents in the development of Bali cattle business

The attitude of extension workers who have in the category of "very positive" as many as 4 people or 25.00% in the development of Bali cattle breeding business, while extension workers who have a positive attitude as many as 6 people or 37.50% and 6 people or 37.50 including the category "less positive in the development of Bali cattle breeding business. The average level of attitude of agricultural extension workers in the development of Bali cattle breeding business is 72.50% of the included scores in the positive category can be seen in Table 6.

Table 6. Distribution of Agricultural Extension Based on Attitudes in the Development of Bali Cattle Farming

No	Attitude	Number of Agricultural Extension	
		(person)	Percentage (%)
1	Very Positive	4	25,00
2	Positive	6	37,50
3	Less positive	6	37,50
4	Not positive	-	-
5	Very Not Positive	-	-
Total		16	100

Source: 2017 Primary Data Processing Results

8. Agricultural extension facilities

All agricultural extension agents, namely 16 people (100%) have incomplete facilities in developing bali cattle breeding business. The average achievement of facility scores in the development of bali cattle breeding business is incomplete category can be seen in Table 8.

Table 8. Distribution of Agricultural Extension by Facilities

No	Facilities	Number of Agricultural Extension	
		(person)	Percentage (%)
1	Very Complete	-	-
2	Complete	-	-
3	Medium	-	-
4	Incomplete	16	100
5	Very incomplete	-	-
Total		16	100

Source: 2017 Primary Data Processing Results

This shows that agricultural extension facilities are still incomplete as agricultural extension agents in the field. Extension facilities need to be supported with adequate facilities when in the field so that the presentation of the development of Bali cattle business can run well and on target. Details of complete data regarding extension facilities in the development of bali cattle breeding business.

The results of the data analysis with the Simple Correlation Coefficient Test showed that the factors that were positively related were each of them between knowledge, skills and distance of residence with the performance of agricultural extension workers in the development of bali cattle breeding business. Motivation and attitude of each factor are significantly related to the performance of agricultural extension workers in the development of bali cattle breeding business. For facilities not related to the performance of agricultural extension agents in the development of Bali cattle breeding business can be seen in Table 9.

Table 9. Relationship of Supporting Factors with Extension Performance

No	Supporting Factors with the Performance of the Extension	Correlation Coefficient
1	Knowledge	0,652**
2	Skills	0,697**
3	Motivation	0,525*
4	Attitude	0,508*
5	Distance of residence	0,689**
6	Facility	-

Source: 2017 Primary Data Processing Results

NB: ** = real positive because the value approaches 1, * = real

Knowledge has a real positive relationship ($P < 0.01$) with the performance of agricultural extension workers in the development of bali cattle breeding business in the District of Long Ikis, meaning that this research hypothesis is accepted. This is due to the large number of agricultural extension jobs lack of training followed by extension agents as basic training in agricultural counseling, training in artificial insemination, beef cattle cultivation, beef cattle agribusiness, agribusiness management, recording beef cattle, processing of livestock products, animal feed preservation, and development rural agribusiness According to Bahua (2010) that training is carried out as an effort to expedite one's learning process, thereby increasing their competence through increasing their knowledge, skills and attitudes in a particular field to support the implementation of their duties.

Skills are significantly positive ($P < 0.01$) with the performance of agricultural extension workers in the development of bali cattle breeding business, meaning that the research hypothesis is accepted. This is because agricultural extension workers lack the ability to conduct counseling well. Many activities are neglected because agricultural extension workers also handle other fields such as plantations and agriculture itself so that the skills for developing the Bali cattle business are not so good.

Motivation was significantly correlated ($P < 0.05$) with the performance of agricultural extension workers in the development of bali cattle breeding business, meaning that this research hypothesis was accepted. This is because agricultural extension agents in this area lack sufficient income that can encourage them to carry out their tasks in the field. This is because most of the extension workers are freelancers (THL), which affects the motivation of agricultural instructors in carrying out their duties.

Attitudes are significantly related ($P < 0.05$) to the performance of agricultural extension workers in the development of bali cattle farming, meaning the hypothesis of this research is accepted. It can be understood that the attitude of agricultural extension officers who are positive can support the performance of agricultural extension agents in the development of Bali cattle business. The form of positive attitude possessed by agricultural extension workers in this area consists of the attitude of extension workers who sincerely help and always set aside time for Bali cattle farmers in developing Bali cattle breeding

business. In the implementation of Bali cattle breeding counseling, agricultural extension workers are also always strong in dealing with farmers even though the work they do is relatively heavy.

IV. CONCLUSIONS AND RECOMMENDATIONS

1. Conclusion

Based on the results of research and discussion, it is concluded as follows:

1. The performance of agricultural extension workers in the development of Bali cattle breeding business in Long Ikis Subdistrict is included in the unfavorable category.
2. The success of breeders in Bali cattle breeding business in Long Ikis Subdistrict is included in the less successful category.
3. The performance of agricultural extension workers is positively related to the success of farmers in the breeder business
4. Knowledge, skills, and distance of residence of agricultural extension workers are significantly positive with the performance of agricultural extension workers in the development of Balinese cattle breeding business, the motivation and attitude of agricultural extension workers are significantly related to the performance of extension workers in the development of Bali cattle breeding in the District of Long Ikis. While the agricultural extension facilities are not related significantly to the performance of extension workers in the development of the breeder business

2. Rekomendations

Based on the results of research and discussion, it is concluded as follows:

1. Given the performance of instructors both from the nature of personality, namely perseverance, discipline, hard work, responsibility, role model and results, the frequency of extension workers, extension program counseling material, changes in behavior and development of Bali cattle business are still low, there needs to be an integrated improvement of extension agents agriculture
2. The need for agricultural extension workers in this area to increase knowledge, skills, motivation and attitudes towards the development of Bali cattle business
3. Need further research on the Performance of Agricultural Extension in the Development of Bali Cattle Farming in the Long Ikis District from the aspect of synergy between the role of agricultural extension agents, farmers and the government.

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AUTHORS

First Author – Abdul Rachim, Agriculture Faculty, Lambung Mangkurat University, Banjarbaru, South Kalimantan, Indonesia

Second Author – Taufik Hidayat, Agriculture Faculty, Lambung Mangkurat University, Banjarbaru, South Kalimantan, Indonesia

Third Author – Hamdani, Agriculture Faculty, Lambung Mangkurat University, Banjarbaru, South Kalimantan, Indonesia

Some Discussion of Gravitational constant and cosmological constant Using Bianchi Type-I cosmological Model

Dr.Gitumani Sarma¹ and D. I. Mazumder²

^{1,2*} University of Science & Technology, Meghalaya

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Abstract- Bianchi Type-I cosmological model in General Relativity is investigated. To get an exact solution of Einstein's Field equation we have taken Gravitational constant and Cosmological constant. It is observed that Einstein's Field Equations are solvable. Some physical and geometrical properties also discussed. Two phenomenological decay of cosmological constant have been discussed.

Index Terms- Cosmological constant, Gravitational constant, Bianchi Type-I metric and Decays Law.

I. INTRODUCTION

Many Researchers stated that the expansion of the Universe is undergoing a late time acceleration (Perlmutter et al.1997,1998,1999; Ries et al.1998,2004; Efstathiou et al.2002; Spergel et al.2003; Allen et al.2004; Sahni and Starobinski 2000; Peebles and Ratra 2003; Padmanabhan 2003; Lima 2004). In General theory of Relativity some sort of Dark energy or any constant varies only slowly with time and space dominates the current cosmos. In fact all scientists have come to take a decision that the Universe is expanding. Because origin and Nature of the Universe acceleration is a question for Researchers. The homogeneous anisotropic models have spatial sections which are flat but the expansion or contraction rate are dependable on direction. From different point of view many researchers have investigated Bianchi Type-I models. Bianchi Type-I homogeneous models have flat spatial sections and the direction of expansion or contraction are dependable. Many Researchers have investigated Bianchi Type-I models from different point of view for observing the effects of anisotropy in the early Universe.

Cosmological constant is the energy density of the vacuum space. It was originally introduced as an addition to his General theory of Relativity to "hold back gravity" and achieve a static Universe. For dark energy existence we can say that energy density stored on the vacuum state of all existing fields is the Universe. In the early stage of the Universe value of Λ was large and decayed with evolution (Dolgov 1983). Einstein introduced the cosmological constant in 1917. According to him Cosmological constant act as a repulsive force to keep the Universe in static equilibrium. Another definition is

cosmological constant is a homogeneous energy density that causes the expansion of the universe to accelerate. In Modern Cosmology, it is the leading parameter for Dark Energy, which is one of the reasons of acceleration of Universe. vacuum energy and the cosmological constant have identical behaviour in general relativity, as long as the vacuum energy density is

$$\rho^{vac} = \frac{\Lambda}{8\pi G}$$

identified with, Λ . The term Λ arises naturally in general relativistic quantum field theory, where it is interpreted as the energy density of the vacuum [1-4]. Some authors [5-9] argued for the dependence of Λ . Bianchi Type-I models are studied by using variable G and Λ [10-16]. Bianchi type-I string cosmological model with bulk viscosity investigated by Tiwari and Sonia [17].

The gravitational constant is an empirical physical constant which is obtained in Newton's law of Universal gravitation and in Einstein's general theory of Relativity. It plays a role in the relation connecting the gravitational force between two bodies with the product of their masses and the inverse square of their distance. In general theory of Relativity it identifies the relation between Spacetime geometry and energy-momentum. Again Gravitational constant plays the role of a coupling constant between matter and geometry in the Einstein's Field equation. Dirac [16-18] and Dicke [14] suggested a time varying gravitational constant for first time. The large number hypothesis (LNH) proposed by Dirac leads to a cosmology when G varies with time. In astrophysics variation of G has many interesting consequence. Canuto and Narlikar [15] have shown that G-varying cosmology is consistent.

II. THE METRIC, FIELD EQUATIONS AND SOLUTIONS

Let us consider Bianchi type-I metric in the form

$$ds^2 = -dt^2 + A^2(t)dx^2 + B^2(t)dy^2 + C^2(t)dz^2$$

The energy momentum tensor of a perfect fluid is represented by

$$T_{ij} = (\rho + p)v_i v_j + p g_{ij}$$

where ρ is the energy density, p is the thermodynamical pressure and v_i is the four velocity vectors of the fluid satisfying the relation

$$v_i v^i = -1$$

The Einstein's field equations with time dependent G and Λ are

$$R_{ij} - \frac{1}{2}Rg_{ij} = -8\pi G(t)T_{ij} + \Lambda(t)g_{ij}$$

For the metric (1) and the energy-momentum tensor (2) in comoving system of coordinates, the field equation (4) yields

$$8\pi G\rho - \Lambda = -\frac{\dot{B}}{B} - \frac{\dot{C}}{C} - \frac{\dot{B}\dot{C}}{BC}$$

$$8\pi G\rho - \Lambda = -\frac{\dot{A}}{A} - \frac{\dot{C}}{C} - \frac{\dot{A}\dot{C}}{AC}$$

$$8\pi G\rho - \Lambda = -\frac{\dot{A}}{A} - \frac{\dot{B}}{B} - \frac{\dot{A}\dot{B}}{AB}$$

$$8\pi G\rho + \Lambda = \frac{\dot{A}\dot{B}}{AB} + \frac{\dot{B}\dot{C}}{BC} + \frac{\dot{A}\dot{C}}{AC}$$

In view of vanishing divergence of Einstein tensor, we get

$$8\pi G \left[\dot{\rho} + (\rho + p) \left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C} \right) \right] + 8\pi\rho G + \Lambda = 0$$

The usual energy conservation equation $T_{ij}^j = 0$ yields

$$\dot{\rho} + (\rho + p) \left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C} \right) = 0$$

Combining (9) and (10) we get,

$$8\pi\rho G + \Lambda = 0$$

Let R denotes the average scale factor of Bianchi type-I cosmology, then

$$R^3 = \sqrt{-g} = ABC$$

Subtracting (6) from (5) we get,

$$\frac{\dot{A}}{A} + \frac{\dot{A}\dot{C}}{AC} - \frac{\dot{B}}{B} - \frac{\dot{B}\dot{C}}{BC} = 0$$

$$\Rightarrow ABC \left(\frac{\dot{A}}{A} + \frac{\dot{A}\dot{C}}{AC} - \frac{\dot{B}}{B} - \frac{\dot{B}\dot{C}}{BC} \right) = ABC \times 0$$

$$\Rightarrow \dot{A}BC + \dot{A}\dot{C}B - \dot{A}BC - \dot{A}\dot{B}C = 0$$

$$\Rightarrow \dot{A}BC + \dot{A}\dot{C}B + \dot{A}\dot{B}C - \dot{A}\dot{B}C - \dot{A}\dot{B}C - \dot{A}\dot{B}C = 0$$

$$\Rightarrow d(\dot{A}BC) - d(\dot{A}\dot{B}C) = 0$$

Integrating we get,

$$\dot{A}BC - \dot{A}\dot{B}C = k_1, \text{ (Constant of integration)}$$

$$\Rightarrow \frac{\dot{A}BC}{ABC} - \frac{\dot{A}\dot{B}C}{ABC} = \frac{k_1}{ABC}$$

$$\Rightarrow \frac{\dot{A}}{A} - \frac{\dot{B}}{B} = \frac{k_1}{R^3} \quad [\text{Using (12)}]$$

Similarly, subtracting (7) from (6)

$$\Rightarrow \frac{\dot{B}}{B} - \frac{\dot{C}}{C} = \frac{k_2}{R^3}$$

Integrating (13),

$$\ln A - \ln B = \int \frac{k_1}{R^3} dt$$

$$\Rightarrow \ln \frac{A}{B} = k_1 \int \frac{dt}{R^3}$$

$$\Rightarrow \frac{A}{B} = \exp \left[k_1 \int \frac{dt}{R^3} \right]$$

$$\Rightarrow A = B \exp \left[k_1 \int \frac{dt}{R^3} \right]$$

Similarly integrating (14) we get,

$$B = C \exp \left[k_2 \int \frac{dt}{R^3} \right] \tag{16}$$

Multiplying (15) by (16) we get,

$$AB = BC \exp \left[(k_1 + k_2) \int \frac{dt}{R^3} \right] \tag{5}$$

From (12)

$$\frac{AB}{ABC} = R^3$$

$$\Rightarrow BC \exp \left[(k_1 + k_2) \int \frac{dt}{R^3} \right] \cdot C = R^3$$

$$\Rightarrow \frac{C^2}{BC} \exp \left[(k_1 + k_2) \int \frac{dt}{R^3} \right] = R^3$$

$$\Rightarrow C \exp \left[k_2 \int \frac{dt}{R^3} \right] C^2 \exp \left[(k_1 + k_2) \int \frac{dt}{R^3} \right] = R^3$$

$$\Rightarrow C^3 \exp \left[(k_1 + 2k_2) \int \frac{dt}{R^3} \right] = R^3$$

$$\Rightarrow C^3 = R^3 \exp \left[-(k_1 + 2k_2) \int \frac{dt}{R^3} \right]$$

$$\Rightarrow C = m_2 R \exp \left[-\frac{(k_1 + 2k_2)}{3} \int \frac{dt}{R^3} \right] \tag{17}$$

From (16) we get,

$$B = R \cdot \exp \left[-\frac{(k_1 + 2k_2)}{3} \int \frac{dt}{R^3} \right] \cdot \exp \left[k_2 \int \frac{dt}{R^3} \right]$$

$$\Rightarrow B = R \cdot \exp \left[\frac{-k_1 - 2k_2 + 3k_2}{3} \int \frac{dt}{R^3} \right]$$

$$\Rightarrow B = m_2 R \cdot \exp \left[\frac{(k_2 - k_1)}{3} \int \frac{dt}{R^3} \right]$$

From (15) we get,

$$A = R \cdot \exp \left[\frac{(k_2 - k_1)}{3} \int \frac{dt}{R^3} \right] \cdot \exp \left[k_1 \int \frac{dt}{R^3} \right]$$

$$\Rightarrow A = R \cdot \exp \left[\frac{(k_2 - k_1 + 3k_1)}{3} \int \frac{dt}{R^3} \right]$$

$$\Rightarrow A = m_1 R \cdot \exp \left[\frac{(2k_1 + k_2)}{3} \int \frac{dt}{R^3} \right]$$

where m_1, m_2 and m_3 are constants of integration and $m_1 \cdot m_2 \cdot m_3 = 1$.

(13) Once the values of A, B and C are obtained, we now discuss the following two cases:

(14) **Case 1:** Cosmological constant Λ is constant

\therefore From (11),

$$G = -\frac{\Lambda}{8\pi\rho} \tag{21}$$

When $\Lambda = \text{constant}, \dot{\Lambda} = 0$

\therefore From (21),

$$G = 0 \Rightarrow G = \text{constant}$$

(15) Thus we observed that when cosmological constant is constant then the gravitational constant is also behaves as constant.

From (20) we have,

$$A = m_1 R \cdot \exp \left[\frac{(2k_1 + k_2)}{3} \int \frac{dt}{R^3} \right] \cdot \frac{(2k_1 + k_2)}{3} \cdot \frac{1}{R^3} + m_1 \dot{R} \cdot \exp \left[\frac{(2k_1 + k_2)}{3} \int \frac{dt}{R^3} \right]$$

$$\Rightarrow \frac{\dot{A}}{A} = \frac{2k_1 + k_2}{3R^3} + \frac{\dot{R}}{R}$$

Similarly,

$$\frac{\dot{B}}{B} = \frac{k_2 - k_1}{3R^3} + \frac{\dot{R}}{R}$$

$$\frac{\dot{C}}{C} = \frac{-(k_1 + 2k_2)}{3R^3} + \frac{\dot{R}}{R}$$

Again

$$\dot{A} = m_1 R^{-2} \exp \left[\frac{(2k_1 + k_2)}{3} \int \frac{dt}{R^3} \right] \cdot \frac{(2k_1 + k_2)}{3} \cdot \frac{1}{R^3} \cdot \frac{(2k_1 + k_2)}{3}$$

$$+ m_1 (-2) R^{-3} \exp \left[\frac{(2k_1 + k_2)}{3} \int \frac{dt}{R^3} \right] \cdot \frac{(2k_1 + k_2)}{3}$$

$$+ m_1 \dot{R} \exp \left[\frac{(2k_1 + k_2)}{3} \int \frac{dt}{R^3} \right] \cdot \frac{(2k_1 + k_2)}{3} \cdot \frac{1}{R^3} + m_1 \dot{R} \exp \left[\frac{(2k_1 + k_2)}{3} \int \frac{dt}{R^3} \right]$$

$$\Rightarrow \frac{\dot{A}}{A} = \frac{(2k_1 + k_2)^2}{9R^6} - \frac{2(2k_1 + k_2)}{3R^4} + \frac{(2k_1 + k_2)\dot{R}}{3R^4} + \frac{\dot{R}}{R}$$

Similarly,

$$\frac{\dot{B}}{B} = \frac{(k_2 - k_1)^2}{9R^6} - \frac{2(k_2 - k_1)}{3R^4} + \frac{(k_2 - k_1)\dot{R}}{3R^4} + \frac{\dot{R}}{R}$$

$$\frac{\dot{C}}{C} = \frac{(k_1 + 2k_2)^2}{9R^6} + \frac{2(k_1 + 2k_2)}{3R^4} - \frac{(k_1 + 2k_2)\dot{R}}{3R^4} + \frac{\dot{R}}{R}$$

We now find the behaviour of the density and pressure

From (6),

$$p = \frac{1}{8\pi G} \left[\Lambda - \left(\frac{\dot{A}}{A} + \frac{\dot{C}}{C} + \frac{A\dot{C}}{AC} \right) \right]$$

$$= \frac{1}{8\pi G} \left[\Lambda - \frac{3k_1^2 + 4k_1k_2 + 3k_2^2}{9R^6} + \frac{2k_1 - 2k_2}{3R^4} - \frac{(2k_1 - 2k_2)\dot{R}}{3R^4} - \frac{\dot{R}}{R} - \left(\frac{\dot{R}}{R} \right)^2 \right] \quad (28)$$

Let us assume that $p = \omega\rho$, where $0 \leq \omega \leq 1$

$$\Rightarrow \rho = \frac{p}{\omega}$$

$$= \frac{1}{8\pi G\omega} \left[\Lambda - \frac{3k_1^2 + 4k_1k_2 + 3k_2^2}{9R^6} + \frac{2k_1 - 2k_2}{3R^4} - \frac{(2k_1 - 2k_2)\dot{R}}{3R^4} - \frac{2\dot{R}}{R} - \left(\frac{\dot{R}}{R} \right)^2 \right] \quad (29)$$

The relationship among physical quantities, (30)

Hubble parameter H , volume expansion scalar θ , shear σ and deceleration parameters q

are

$$H = \frac{\dot{R}}{R}$$

$$\theta = 3H = \frac{3\dot{R}}{R}$$

$$\sigma = \frac{k}{\sqrt{3}R^3}, \text{ k is a positive constant.}$$

$$\text{i.e. } \sigma \propto \frac{1}{R^3}$$

$$q = -1 - \frac{\dot{H}}{H^2} = -\frac{R\ddot{R}}{R\dot{R}^2}$$

Case 2: Cosmological constant Λ is variable

We consider the decays laws

- i. $\Lambda \propto H^2$
- ii. $\Lambda \propto \frac{1}{R^2}$

[1]

[2] First we assume $\Lambda = 3\beta H^2$ (i.e. $\Lambda \propto H^2$)

$$\therefore \text{from (21)} \quad \frac{\dot{\Lambda}}{\Lambda} = \frac{2\dot{H}}{H}$$

$$\dot{G} = -\frac{3\beta}{4\pi\rho} H\dot{H} \quad (22)$$

$$\Rightarrow \frac{dG}{dt} = -\frac{3\beta}{4\pi\rho} H \frac{dH}{dt} \quad (23)$$

$$\Rightarrow dG = -\frac{3\beta}{4\pi\rho} H dH \quad (24)$$

$$\text{Integrating, } G = -\frac{3\beta H^2}{8\pi\rho}$$

i.e. $G \propto H^2$

Hence when time increases, pressure decreases, Gravitational constant is directly proportional to the square of the Hubble parameter and assumed the density as a constant.

[3] Next we assume $\Lambda = hR^{-2}$; h is constant. (i.e. $\Lambda \propto \frac{1}{R^2}$)

$$\therefore \frac{\dot{\Lambda}}{\Lambda} = -2hR^{-3}\dot{R}$$

[4] From (21)

$$\dot{G} = \frac{hR^{-3}\dot{R}}{4\pi\rho} \quad (25)$$

$$\Rightarrow \frac{dG}{dt} = \frac{hR^{-3}}{4\pi\rho} \frac{dR}{dt} \quad (26)$$

$$\text{Integrating, } G = \frac{h}{4\pi\rho R^2}$$

i.e. $G \propto \frac{1}{R^2}$

It should be noted that G and Λ appears as indirectly coupled fields, similar to the case of G in the original Brans-Dicke theory

III. PHYSICAL INTERPRETATIONS

Deceleration Parameter is

$$q = \frac{2\ddot{R}}{R} - \left(\frac{\dot{R}}{R} \right)^2$$

From this we get

(31)

When

$$\Lambda \geq 0, \quad 0 < \frac{\sigma^2}{\theta^2} \leq \frac{1}{3}$$

And

$$0 < \frac{\rho}{\theta^2} \leq \frac{1}{3}$$

It is seen that the ratio between density and square of expansion scalar lies between 0 and 1/3 for cosmological constant 0 or positive. This indicates about upper limit of Anisotropy. From equation (a) we obtain

$$\frac{3\sigma^2}{3H^2} = 1 - \frac{\rho}{\rho_C} - \frac{\rho_\Lambda}{\rho_C}$$

(32)

$$\rho_C = 3H^2$$

Is the critical density and

$$\rho_\Lambda = \Lambda$$

Is the vacuum density. Hubble Parameter H can also be expressed as

$$H = \frac{1}{3} \left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C} \right)$$

It is observed that Hubble parameter gives a decrease value with the increase of time. Also Expansion scalar decreases with time increases.

In case ii, we consider decaying vacuum energy density. i.e

$$\Lambda = kH^2$$

(a)

Where k is a constant. From field equation (8) we get

$$3H^2 - \sigma^2 = \rho + \Lambda$$

(b)

When the Universe expanded energy density decreases and an infinitely large R corresponds to a ρ close to zero. For this

$$3H^2 - \Lambda \rightarrow 0$$

(i) Cosmological constant must be positive

(ii) Since Hubble parameter zero R becomes constant

(iii) For positive cosmological constant the evaluation of Universe never comes to halt. It is observed that the presence of dark energy i.e positive cosmological constant gives the accelerated universe.

From (a) and (b)

$$k = \frac{3\Omega}{1 + \Omega} \left(1 - \frac{\sigma^2}{27\theta^2} \right)$$

Where

$$\Omega = \frac{\Lambda}{\rho}$$

(c)

Deceleration Parameter q can be obtained as

$$q = 2 - k$$

Recent observations by S.Perlmutter [25] gives that the present universe is accelerating phase and deceleration parameter lies somewhere in the range $0 < q \leq 1$. It also follows that our model of the universe consistent with recent observations. The deceleration parameter q approaches the value zero (when a= -3) as in the case of De-sitter universe.

IV. CONCLUSIONS

We have investigated Bianchi type-I cosmology containing barotropic equation of state and cosmological term proportional

to the square of Hubble parameter and inversely proportional to the square of the scale factor. It is observed that this model gives a Universe which is not start from early stage. As proper volume becomes infinitely large as t tends to infinity, the other physical quantities such as density, pressure, shear becomes insignificant. Also shear tends to zero faster than the expansion. From equation (28) and (29) it is seen that Pressure and density decreases with the expansion of the Universe. It is found that deceleration parameter value is 2 when k=0. And for k=2, deceleration parameter is 0. Thus it is observed that contraction or expansion of the Universe depends on deceleration parameter. Also it is seen that Gravitational constant behaves like cosmological constant behaviour. When cosmological constant is constant, Gravitational constant also constant. Equation (32) gives an empty Universe When time $t \rightarrow \infty$. Another important matter that during variation of cosmological constant density observed as a constant.

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AUTHORS

First Author – Dr.Gitumani Sarma University of Science & Technology, Meghalaya, gmani.sarma@gmail.com
Second Author – D. I. Mazumder, University of Science & Technology, Meghalaya, dilu.bty@gmail.com

Genetic Polymorphism of Red Cell Phosphoglucomutase (PGM) in Population of Maharashtra and its Applications in Forensic Science

B. T. Shah, K. J. Joshi and Dr. (Mrs.) V. R. Rathod

Directorate of Forensic Science Laboratory, Kalina, Mumbai.

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Abstract: Any polymorphism in human blood has a potential use for the forensic scientist in his attempt to typify blood in dried stain form or to separate and distinguish between two or more possible sources for that stain. PGM₁ typing is an important system used to solve the paternity disputes as well as other medicolegal cases. The present study was undertaken to determine the gene frequency of Phosphoglucomutase (PGM₁) subtype in the population of Maharashtra. Isoelectric focusing was used for the separation of the PGM₁ types from dried blood stains. The study could help in finding any characteristic signs of any phenotype in a population. The Gene frequencies were estimated as follows:

$1^+ = 0.61$, $1^- = 0.19$, $2^+ = 0.12$, $2^- = 0.07$.

Index Terms: Isoenzymes, IEF (Isoelectric Focusing), Gene frequency, polymorphism, PGM (Phosphoglucomutase), alleles, phenotype.

I.INTRODUCTION

The multiple forms of an enzyme catalyzing the same reaction are isoenzymes or isozymes. Isoenzymes are common in sera and tissues of all vertebrates, insects, plants and unicellular organisms. Different tissues may contain different isoenzymes and these isoenzymes may differ in their affinity for substrates. Electrophoresis, Ion exchange chromatography, Chemical inhibition, Heat inactivation techniques can be used for the separation of Isoenzymes. Phosphoglucomutase (PGM) is widely distributed in mammalian tissues. It is present in the red blood cell, semen and sometimes in vaginal secretion.

Genetics of Phosphoglucomutase (PGM):

The polymorphism of the phosphoglucomutase (PGM) system was first demonstrated by starch gel electrophoresis studies conducted by Spencer et al. (1) on the enzyme from the human red cells. Pedigree studies (2) have shown that two common autosomal alleles PGM₁¹ and PGM₁² are situated on the same locus of chromosome 1(3). They are responsible for determining the three common phenotypes PGM₁¹, PGM₁² and PGM₁²⁻¹. These are observed by starch gel electrophoresis (1). The electrophoresis pattern of the PGM₁¹ is characterized by two isoenzymes 'a' and 'c' while isoenzymes 'b' and 'd' are associated with the PGM₁² phenotype; the heterozygote PGM₁²⁻¹ has all four isoenzymes (1). Subsequent investigation have shown that a further two loci PGM₂ and PGM₃ located on different chromosomes viz 17 and 18 exist, each of which determines a separate set of isoenzymes which are inherited independently in a simple Mendelian fashion (4-6).

Principles of Isoelectric Focusing:

The isoelectric point (pI) of a protein is defined as the pH where the net charge of the protein is zero. A protein in an environment with pH below its pI will be positively charged, and when the pH is above the proteins pI, the charge will be negative. Since the charge of the protein determines the direction of migration in an electric field at a pH above or below its pI, a protein will migrate toward the anode or cathode, respectively. When the pH is equal to its pI, the protein possesses a net charge of zero and cannot migrate in an electric field (7). IEF exploits this behavior for protein separation allowing for sensitivity and resolution not possible with conventional electrophoresis.

The difference between the resolving capabilities of IEF and conventional electrophoresis lies in the pH with in the resolving gel. Protein separation is accomplished in a pH gradient using IEF while the pH is essentially constant throughout the resolving gel with

conventional electrophoresis. Thus, conventional electrophoresis separates proteins based on mobility (charge to mass ratio differences) and IEF separates proteins based on pI values. The result is narrower, more resolved bands on IEF gels.

II. MATERIALS AND METHODS

Selection of the subjects:

The blood samples were collected from 490 individuals of both sexes within the age range from 18 to 60 years selected at random to represent the cross section of population. This included families belonging to different religions.

Preparation of Bloodstains:

The blood stains were prepared from healthy individuals. Bloodstains were made from finger pricks on starch free cotton cloth. The stains were then air-dried, labeled and kept in small bottles. The bottles were also labeled and stored in deep freeze.

Isoelectric Focusing :

A. Reagents:

All reagents used for electrophoresis and subsequent staining were of Sigma or an Equivalent grade. All the reagents were prepared in Distilled water.

For one plate of 0.3mm thickness

Sucrose (37.5%)-4ml

Acrylamide (6%)-4ml

Acrylogel (9%)-4ml

Riboflavin (0.01%)-0.1ml

Ampholine (pH5-7)-0.5ml

The mixture was mixed and degassed.

A convenient way to remove the ampholine was by using a disposable luer syringe with a 21g hypodermic needle. It was ensured that the ampholine and acrylamide solutions were uniformly mixed by gently swirling of the flask and then degassing under vacuum.

B. Procedure:

1. Preparation of ultra-thin plates:

1. Both the plates – thin plate (2mm thickness) and thick plate (5mm thickness) were cleaned thoroughly with methanol so that the plates were grease free.
2. Thin plate was kept on leveling platform and then clean spacer of 0.3 mm thickness was placed on it.
3. The degassed mixture was poured on the thin plate and the thick plate was slid to cover it. Care was taken to avoid trapping of air bubbles between the two plates.
4. The plates were clamped and immediately kept on fluorescent tube for 2.5 hours to allow photopolymerisation to occur.
5. Then the plates were kept in fridge (4⁰C) for about half an hour for easy separation of plate. The top plate was removed immediately prior to sample application.
6. The plates were detached by inserting scalpel blade in between thick plate and spacer from one corner.
7. The thin plate with gel was kept on a cooling plate in the IEF instrument. The temperature of cooling plate was 5⁰C.

All the IEF work was conducted on the LKB 2217 Ultraphor electrophoresis cells and the LKB2303 MultiDrive XL power supply, supplied by LKB Pharmacia Instruments Sweden.

2. Prefocussing:

The conditions for the Prefocussing are as follows:

Volts	Current	Wattage	Volt hours	Time
1500 volts	15 amp	15 watts	0	30 minutes

3. Preparation of sample for loading on gel:

0.5 x 0.5 piece of the bloodstain was taken & soaked in distilled water. The fibres were teased to get proper extract. After prefocussing was over, the samples were loaded by using 0.75 x 0.5 cm 1mm Whatman paper, soaked in the above extract. Also known standards of PGM1⁺1⁻, 2⁺2⁻ and 1⁺2⁻ were loaded in same way.

4. Condition for run: The conditions for the electrophoresis are as follows:

Volts	Current	Wattage	Volt hours	Time
1500 volts	15 amp	15 watts	3500	2.20 hours

After 30 mins the electrophoresis was stopped. The filter papers were removed and then the electrophoresis was again started. When volt hours reached 3500/3500 the electrophoresis was stopped which is approx. 2.20 to 2.30 hrs. The plate was removed from the cooling plate and kept on leveling stand for staining (8).

C. Staining Procedure:

1. Stock solution

- a. Glucose -1-phosphate -300mg/ml
- b. Magnesium chloride-200mg/ml.
- c. MTT Tetrazolium-250mg/ml.
- d. NADP-15mg/ml.
- e. PMS-25mg/ml.
- f. Glucose-6-phosphate dehydrogenase -20ul
- g. PGM staining buffer – (0.06M tris HCL) – pH 8.0.

2. Staining of gel:

300mg Agarose was taken in 20ml Buffer and allowed to melt. The glass strips were kept on the border of the gel and were blocked by agarose. 15ml of PGM reaction buffer was taken in conical flask and 0.2ml G-1-P, 0.2 ml NADP, 0.2 ml MgCl₂, 0.2 MTT, 0.2ml PMS, 20ul G-6pd was added to it. Also remaining melted agarose was added in conical flask, poured on the plate and the solution was scraped with rod while pouring. The solution was cooled in dark. The plate was kept in incubator at 37°C for about 20 mins and the results were observed.

III. RESULTS & DISCUSSION

PGM is a phosphotransferase (E. C. NO 2.7.5.1) which catalyses the conversion of Glucose -1-phosphate to Glucose-6-phosphate in the presence of small amounts of Glucose -1, 6-diphosphate in an early stage of the glycolytic pathway. Glucose 1, 6- diphosphate is required as a cofactor together with magnesium ions. The Mg ++ ion greatly enhances the activity of PGM (1, 9). Glucose -6-phosphate is used as a substrate for Glucose -6- phosphate dehydrogenase, which forms 6-phosphogluconate. This enzyme requires NADP as coenzyme, which itself is reduced to NADPH. Phenazine methosulphate (PMS) is used as a transfer agent. MTT tetrazolium is reduced to a blue colored formazan as shown in Figure 1 and the NADPH is oxidized back to NADP. The bands of PGM activity are hence seen as blue bands on a yellow background on the starch gel (1, 9).

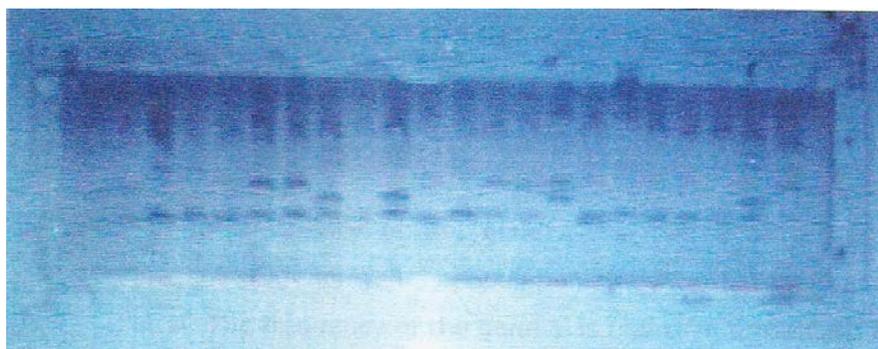


Figure 1: Blue bands of PGM subtypes by IEF

Ishimoto and Kawata (10) first investigated the separation of PGM by isoelectric focusing at low voltage. They confirmed the existence of 3 PGM₁ phenotypes. They obtained more bands than are normally seen by starch gel electrophoresis.

Later work by Burdett and Whitehead (11) confirmed these observations. Bark et al. (12) examined 150 blood samples and proposed that the more complex band patterns, which gave ten distinct phenotypes instead of the three normally seen by starch gel electrophoresis, were due to the presence of four isoenzymes which they called 1+, 1-, 2+, 2-. They suggested that the 1+1- and 2+2- isoenzymes were equivalent to the “a” and “b” isoenzymes, respectively, formerly proposed by Spencer et al. (1).

In a study conducted by Kuhn et al. (13) using a wide spectrum ampholine gradient (pH 3.5-9.5) demonstrated the existence of 10 phenotypes by isoelectric focusing which they believed were also due to the presence of two additional common alleles at the PGM₁ locus (2). Sutton and Burgess (14) have shown that these alleles are inherited in a Mendelian fashion.

In the present study all ten phenotypes expected in a system with four co dominant alleles have been observed. In Table 1 the subtype distributions in examined population are shown. The Gene frequencies were estimated as follows:

$1^+ = 0.61$, $1^- = 0.19$, $2^+ = 0.12$, $2^- = 0.07$. Also, the observed gene frequency is compared with the gene frequencies given by Spencer et al (1)

TABLE 1: PGM₁ Phenotype and Gene Frequency distribution in population of Maharashtra

Phenotype	Number observed	Gene frequencies in present study	Gene frequencies by Spencer et al
1+1+	150	$PGM^{1+1} = 0.61$	$PGM^{1+1} = 0.618$
1+1-	150		
1-1-	8	$PGM^{1-1} = 0.19$	$PGM^{1-1} = 0.122$
1+2+	93		
1+2-	50	$PGM^{2+1} = 0.12$	$PGM^{2+1} = 0.142$
1-2+	10		
1-2-	14	$PGM^{2-1} = 0.07$	$PGM^{2-1} = 0.118$
2+2+	6		
2+2-	6		
2-2-	3		
Total	490		

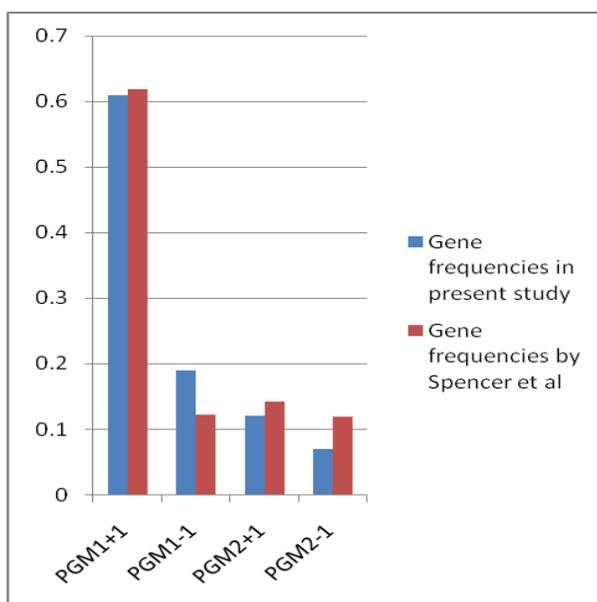


Figure 2: Graph showing gene frequencies in present study and study conducted by Spencer et al (1).

The frequency of gene 1⁺ is almost same in the present study as well as population study carried by Spencer et al (1). The frequency of gene 1⁻ is higher in the present study. The frequency of gene 2⁺ is slightly lower in present study. There is a significant difference in the frequency of 2⁻ in both the population studies. It is very less in present study.

TABLE 2: Gene frequency comparison between the genders

Gene	Frequency	
	Males	Females
1 ⁺	0.625	0.6
1 ⁻	0.2125	0.17
2 ⁺	0.1125	0.12
2 ⁻	0.05	0.11

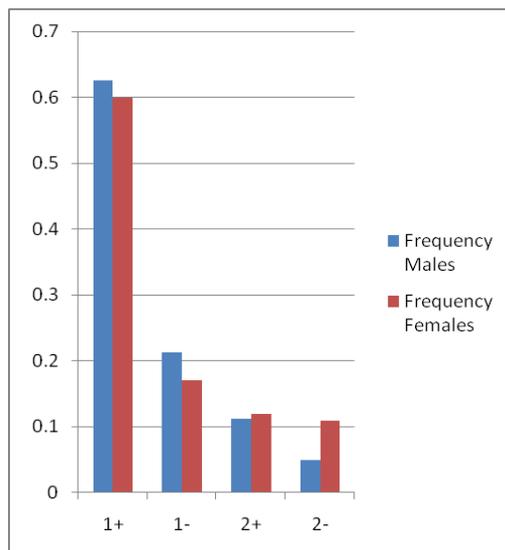


Figure 3: Graph of gene frequency comparison between the genders

The frequency of the gene 1⁺ is marginally higher in males than in females. The occurrence of gene 1⁻ is slightly higher in males than in females. The frequency of gene 2⁺ is slightly higher in females than in males. The frequency of gene 2⁻ is very high in females compared to that in males.

Thus, though the trend of the gene frequency is same in the present population study i.e. 1⁺ followed by 1⁻, 2⁺, 2⁻, a significant difference in the individual gene frequencies was observed from study carried by Spencer et al (1). So, the gene frequency i.e. a particular phenotype may be a characteristic of that population and could be used for distinguishing the person.

The value of any polymorphic system in discriminating between different individuals is most conveniently expressed in terms of its discriminating power (DP). The discriminating power (DP), which is 0.58 for the three phenotypes by starch gel electrophoresis, increases to 0.79 for the ten phenotypes observed by IEF, which is of great forensic value.

In some criminal cases the fresh blood sample is not available. In that case PGM can be done from a deep-seated muscle, bone marrow and hair roots. Also, the material required is very less. Thus, PGM can reduce the burden on DNA profiling.

The PGM typing of the blood can be compared with that of the semen in cases of sexual offences, since the PGM of blood and semen have identical mobility in electric field. This would help in the conviction of the criminal with more convincing evidence. The same can be applied in case of a paternity dispute where the PGM typing of blood can be compared with that of hair roots.

IV. CONCLUSION

The PGM polymorphism could be used to solve the paternity cases in a shorter time and economically. It takes a long time to get the DNA profiling reports of the accused. Also, the cost of DNA profiling is very high and requires sophisticated Genetic Analyzer. Instead the PGM subtyping can be routinely used by the forensic scientist to identify the accused person by elimination test. This would reduce the burden on DNA profiling and will help to solve the paternity dispute.

Similarly, PGM can also be done for other routine cases in the forensic lab. Presence of a particular phenotype of the Phosphoglucosmutase (PGM₁) characteristic of a particular population of the area, if any, will be helpful in narrowing down the criminal and would make easy identification of the accused in criminal cases.

Thus, in this study PGM₁ polymorphism by using IEF technique was conducted on the population of Maharashtra. The IEF technique used in this study gives well separated, sharp and more concentrated bands. It would require very less stained material as compared to any prevailing methods. Besides this technique is less time consuming

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First Author - B. T. Shah, M.Sc. Biochemistry, Directorate of Forensic Science Laboratory, Mumbai, bhavesd.dude@gmail.com

Second Author - K. J. Joshi, M.Sc. Biochemistry, Directorate of Forensic Science Laboratory, Mumbai, kjbioc@yahoo.com

Third Author - Dr. (Mrs.) V. R. Rathod, Ph.D., Directorate of Forensic Science Laboratory, Mumbai, varsha_rathod@hotmail.com

Correspondence Author – B. T. Shah, bhavesd.dude@gmail.com, 91-9869160387.

Improvement of Concrete Strength by Bacterial Mineral Precipitation

Shalini Srotaswini

M. Tech in Civil Engineering, Institute of Technical Education & Research, Bhubaneswar, Odisha

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Abstract - The objective of the present investigation is to obtain the influence of facultative bacteria (*Bacillus Cereus*) on the strength of concrete made with and without bacteria. Three different cell concentrations ($10^2, 10^7, 10^{10}$ cells/ml) of bacteria are used in making the concrete mixes. In making concrete, one control specimen is prepared and three more mixes are also prepared by voluntarily replacing of 10, 20 and 30 litres of bacterial nutrient medium with water. Split Tensile strength test is performed at the age of 7, 14 and 28 days. Test results indicate that inclusion of *Bacillus Cereus* in concrete enhances the compressive strength. Maximum 25.64% increase in compressive strength is observed with 10^7 cells/ml of bacteria. The improvement in strength takes place due to microbiologically induced calcite precipitation (MICP). MICP is a layer of highly impermeable calcite deposition on the surface of already existing concrete layer. The effect of MICP is quantified by X-Ray Diffraction (XRD) analysis and visualized by Scanning Electron Microscopy (SEM).

Index Terms - *Bacillus Cereus*, Split Tensile Strength, SEM, XRD.

1. INTRODUCTION

Dam is the structure built across a river or stream to retain water. Now-a-days multipurpose dams are constructed to serve purposes like flood control, supply of water for day to day use, for generation of hydroelectric power, for irrigation purpose, for supply to industry and for recreational activities. Dams can be classified into different categories depending on the type of building materials used. Rigid building materials like masonry, concrete, timber, steel are used for constructing rigid dams where as earth and rock-fill are used for constructing non-rigid dams. In this paper we are going to discuss about concrete dams. Concrete is one of the most durable and long lasting products used in our construction industry. But it is a well known fact that concrete is susceptible to crack. Crack is the separation of portion of a structure into one or more parts. Crack can be categorized into different groups depending on the reasons like structural crack, shrinkage crack and thermal crack. Structural cracking occurs due to poor soil bearing capacity and overloading of structure. Shrinkage crack in concrete occurs due to change in moisture of concrete. Concrete is porous in its structure in the form of inter-molecular space. It expands when it absorbs moisture and shrinks when it dries. This is the main cause of concrete shrinkage crack. Temperature difference within a concrete structure may be caused by portions of the structure losing heat of hydration at different rates or by the weather conditions. Cooling or heating one portion of the structure to a different degree or at a different rate than another portion of the structure leads to thermal crack. Crack enables the entry of foreign materials like chemicals or water to the structure, which further tends to degrade the quality and performance of concrete structure. Nowadays a new technology is used to improve the strength and durability of concrete by self healing process. Self healing can be done by number of ways, out of which bio based healing is one of them. In this process some specific species of bacteria are inserted into the structure during the construction stage. The bacteria in concrete can remain in dormant condition for hundreds of years. When crack occurs, it leads to the entry of foreign agencies like water and oxygen from atmosphere to the structure. After coming in contact with foreign agencies, bacteria become active and react with calcium present in cement composition producing calcium carbonate (CaCO_3). This microbiologically induced calcite precipitation (MICP) produces a layer of highly impermeable calcite deposition on the surface of already existing concrete layer that tends to seal the crack.

2. EXPERIMENTAL PROGRAM

2.1 Properties of Bacteria (*Bacillus Cereus*)

For this experiment, bacteria named *Bacillus Cereus* were collected from the Microbial Type Culture Collection and Gene Bank (MTCC) Chandigarh. Characteristics of bacteria are shown in **Table 1**.

Table 1: Detail description of *Bacillus Cereus*

MTCC No	430
Name of Bacteria	<i>Bacillus Cereus</i>
Genus	Bacillus
Species	Cereus
Amount Ordered	1 Culture
Growth Medium	3
Temperature	30°C
Incubation Time	24 hour
Subculture	30 Day
Special Feature	Assay of chlortetracycline, oxytetracycline and tetracycline
Gram Strain	Positive
Shape	Rod
Oxygen Demand	Facultative

2.2 Properties of Ordinary Portland Cement

Ordinary Portland Cement of 43 grade was used in concrete. It was tested as per Indian Specifications IS: 8112-1989 and the results are shown in **Table 2**.

Table 2: Physical properties of Cement

Characteristics		Values Obtained Experimentally
Normal Consistency		32.50%
Fineness		340 m ² /kg
Initial Setting time		121 minute
Final Setting time		410 minute
Specific Gravity		3.15
Compressive Strength	3 days	30 MPa
	7 days	43 MPa
	28 days	51 MPa

2.3 Properties of Fine Aggregates and Coarse Aggregates

Natural sand with 4.75 mm maximum size was used as fine aggregate. Sand was supplied from River Kuakhai for the experiment. For coarse aggregates, crushed stone with maximum 12.5 mm graded aggregates (nominal size) was used. **Table 3** summarizes the test result of fine aggregates and coarse aggregates as per IS: 383-1970.

Table 3: Physical properties of Fine aggregate & Coarse aggregate

Characteristics	Value obtained experimentally as per IS:383-1970	
	Fine Aggregate	Coarse Aggregate
Size of the aggregate	---	20 mm
Type of aggregate	---	Angular Coarse Aggregate
Specific Gravity	2.68	2.77
Water Absorption	0.8	0.22
Impact Value	---	29.63%
Abrasion Value	---	47.46%
Flakiness Indices	---	21.18%
Fineness Modulus	2.76 (Zone 2)	6.93
Crushing Value	---	24.50%

2.4 Concrete Mix Proportions

Concrete mixtures were designed as per IS: 10262-1982 with and without using bacteria. **Table 4** shows the detail of mix proportion with water cement ratio used in this experiment.

Table 4: Detail of design mix

Ordinary Portland Cement	Cement (Kg/m ³)	Sand (Kg/m ³)	Aggregate (Kg/m ³)	Water (litre)
Mix Proportion 1:1.535:2.746 & Water Cement Ratio 0.43	432.5	664	1186	186

2.5 Preparation of Test Specimens

Concrete cylinder of size 300×150 mm were prepared with different concentrations of bacterial cells (*Bacillus Cereus*). All experiments were performed in triplicates. Specimen properties were determined at the age of 7, 14 and 28 days.

2.6 SEM of Concrete Samples

SEM is an electron microscope producing images of a sample by scanning it with the help of a focused beam which contains electrons. The atoms present in the surface of sample react with electrons and produce different signals which contain information about the composition of sample. Sample of size 1cm×1cm×1mm were prepared from the main sample. The samples were gold coated. The electron beam has a tendency to scan the sample surface, then with the help of detected signal of beam produce image. It can achieve resolution less than 1 nanometre.

2.7 XRD of Concrete Samples

XRD is a rapid analytical technique primarily used for phase identification of a crystalline material and can provide information on unit cell dimensions. The analyzed material was finely ground, homogenized, and average bulk composition was determined. By using this technique, identification of foreign phases for purity analysis of crystalline powders was done. In XRD analysis, a focused X-ray beam is shot at the sample at a specific angle of Incidence. The X-ray deflects in various ways depending on the crystal structure of the sample. For typical powder patterns, data is collected at 2θ from ~5° to 70° angles that are preset in the X-ray scan.

3. RESULT AND DISCUSSION

The strength of control concrete was calculated after 7, 14 and 28 days of curing. Then by volumetric replacement of water with bacterial nutrient medium three different mixes were prepared with different cell concentrations. Split Tensile strength test was conducted as per BIS: 5816-1970.

The comparison between Control concrete and bacterial concrete is observed in the **Figure 1**. Here three different cell concentrations of bacteria are used, by volumetric replacement of bacterial nutrient medium with water. For cylindrical specimen overly there is an increase in strength as compare to control specimen in all three cases. For MC1 mix BN30, MC2 mix BN20 & MC3 mix BN10 gives good strength as compare to other two nutrient medium. By comparing overall result we can say that MC2BN20 gives best result. With increase in curing period the increase in strength is uniform for all specimens but in case of MC2BN20 after 14 days of curing there is sudden rise in strength takes place. MC3BN30 which has the higher cell concentration with highest replacement gives the least strength for cylindrical specimen. The compressive strength of concrete cubes prepared without and with bacteria is summarized in **Table 5**.

Results of SEM and XRD analysis done on broken samples of without and with bacterial specimen having highest strength i.e. MC3BN10 are shown in **Figure 2** and **Figure 3** respectively.

Table 5: Effect of addition of *Bacillus Cereus* on Split Tensile Strength

Mix Identification	7 Days		14 Days		28 Days	
	Average Split Tensile Strength (Mpa)	% Change in Split Tensile Strength wrt Control Specimen	Average Split Tensile Strength (Mpa)	% Change in Split Tensile Strength wrt Control Specimen	Average Split Tensile Strength (Mpa)	% Change in Split Tensile Strength wrt Control Specimen
MC0BN0	3.00	0	3.50	0	3.90	0
MC1BN10	3.20	6.67	3.65	4.28	4.10	5.12
MC1BN20	3.45	15.0	3.95	12.85	4.35	11.53
MC1BN30	3.90	30.0	4.35	24.28	4.75	21.79
MC2BN10	3.55	18.33	3.80	8.57	4.30	10.25
MC2BN20	3.65	21.67	3.90	11.42	4.90	25.64
MC2BN30	4.00	33.33	4.25	21.42	4.60	17.94
MC3BN10	4.45	48.33	4.50	28.57	4.70	20.51
MC3BN20	4.05	35.0	4.15	18.57	4.25	8.97
MC3BN30	3.60	20.0	3.85	10.00	4.10	5.12

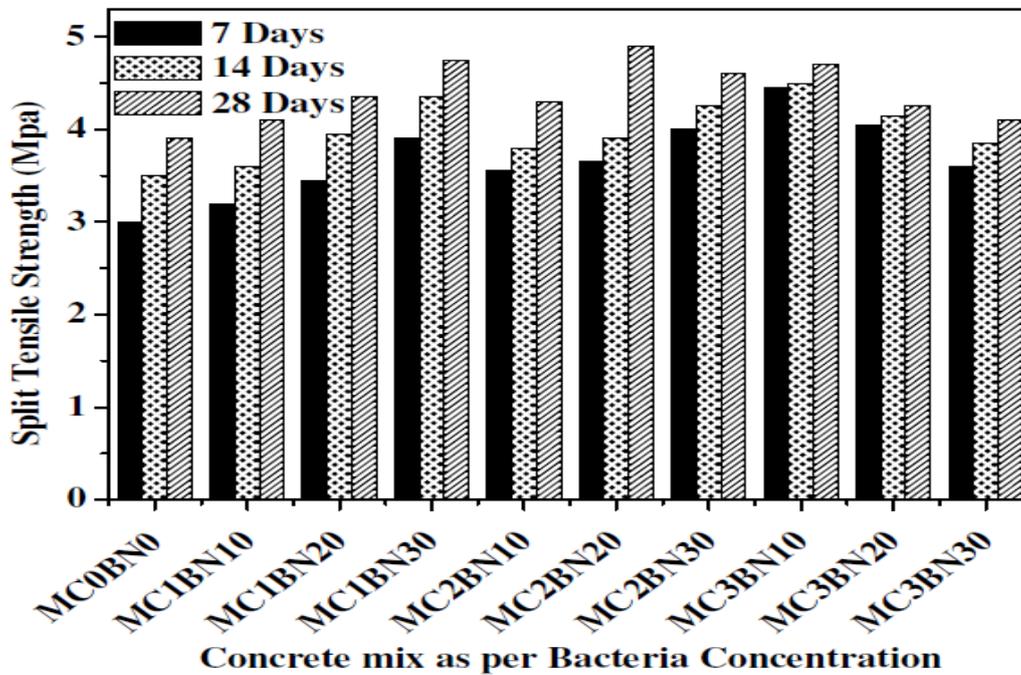
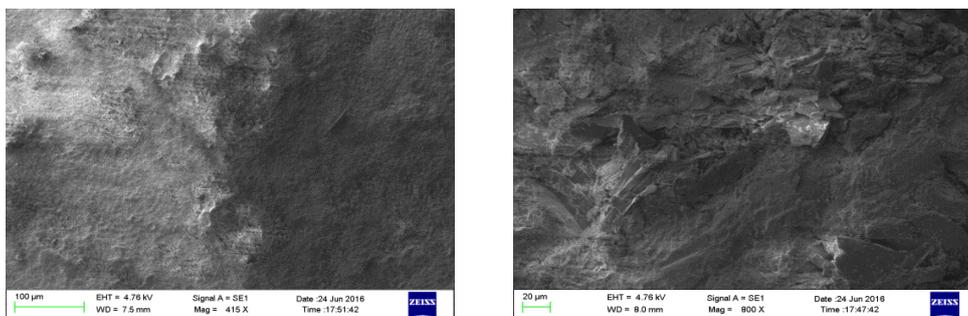


Figure 1 Comparison for split tensile strength between control and bacteria based concrete



Control Sample

Cell Concentration 10^7 cells/ml

Figure 2 SEM of concrete samples without bacteria and with bacteria

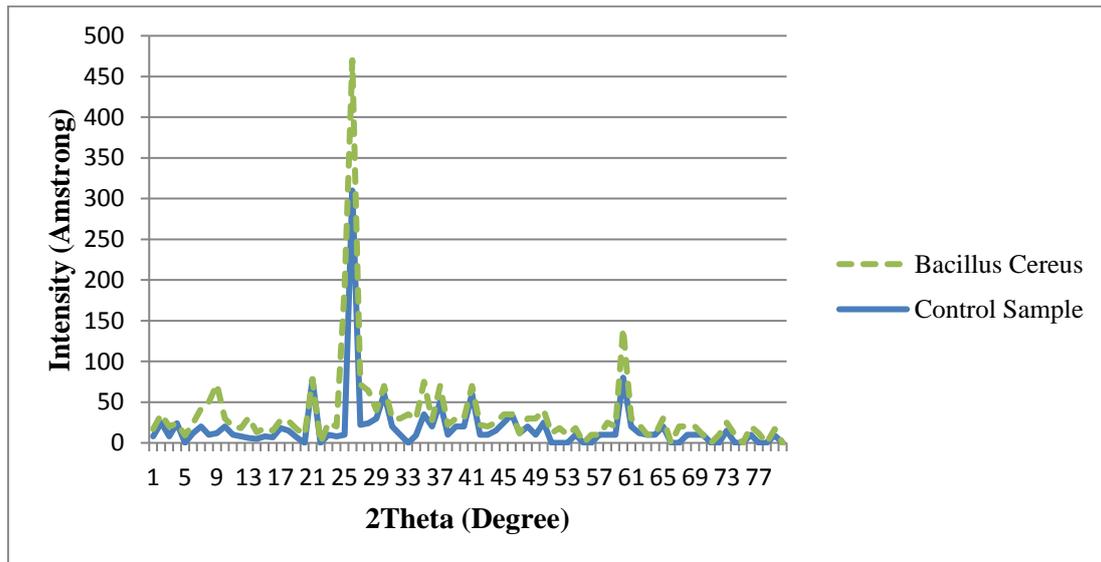


Figure 3 XRD of concrete samples without and with bacteria

4. CONCLUSION

- *Bacillus Cereus* plays a significant role in increasing the compressive strength of concrete by up to 25.64% at the age of 28 days.
- The increase in strength is mainly due to the development of calcite precipitation which tends to fill the pores inside the concrete specimen.
- Highest increase in strength was reported for bacteria with cell concentration of 10^7 cells/ml, so we can assume that higher the cell concentration higher will be the strength.
- But as 20 litres volumetric replacement of bacterial nutrient medium gives better result compared to 30 litres, it can be concluded that after reaching a certain level, the strength remains constant and does not increase with increase in bacterial medium.
- As bacteria can live hundreds of years and has an ability of self healing so we can this technique in under water construction can be effectively implemented to decrease the chances of future collapse.

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K-12 Mathematics Curriculum in Grade 7 learners: Basis for Instructional Material's Development

Emybel M. Alegre, PhD

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Abstract: The study was to determine the perceived difficulties of K-12 Mathematics Curriculum in Grade 7 students. The adoption of the new curriculum (K-12) is said to enhance the quality of basic education. Additionally, the K to 10 Mathematics Curriculum provides a solid foundation for Mathematics at Grades 11 to 12. It has composed of five content areas which are: (1) Numbers and Number Sense; (2) Measurement; (3) Geometry; (4) Patterns and Algebra; (5) Probability and Statistics. However, hypothesis the formulated, "Students-teachers' factors and utilization of instructional materials do not significantly influence the perceived difficulties of K-12 Mathematics Curriculum in the grade 7 students of Agusan National High School.

I. Introduction

The K-12 Mathematics as one of the subject areas in the new implemented curriculum (K-12) is providing opportunities for the students to express ideas consisting of a deep understanding of the concept of quantities, shapes and figures, functions, logic and reasoning. That is, students must need to acquire sufficient knowledge of the concepts and well-comprehend the importance of Mathematics concerning with real life application especially in solving real life problems.

Yet today, as in the past, lots of student in all ages and levels of education find mathematics difficult to deal with. Usually, students lack the ability to easily connect the mathematical concepts of mathematics in day-to-day living.

According to Linther (2011), many learning and achievement difficulties are directly related to inherent mathematical difficulties within specified concepts. It is clear that students' concept images often differ substantially from the concept definitions, not only in the sense that they are incomplete but also in characteristics. It is also clear that a conceptual understanding is not sufficient for mathematical proficiency.

The idea is already widely known that one must have mathematical ability to deal the world inside in mathematics. The mathematical difficulty has something to do with the parts of the teachers and students themselves during the teaching and learning process.

Moreover, Bacalangco (2011) stated that it is a familiar notion that people learn mathematics in different ways. Some people remember best what they have seen. Others are good in words. Some may be competent in solving problems but have difficulty learning mathematics formulate. There are students who are good with their hands or who have creative, artistic talent and flair but who have difficulty with more formal mathematics learning and who do not see themselves as able learners at all.

Also, Onwumere (2009) said that every individual is unique and learns in a particular way. This implies that any teaching which does not take into account student limiting factors for learning rarely succeeds. Teachers who understand the learning needs of their students are more empowered to provide the kind of instruction their students need. Knowing why a student is struggling to learn provides a basis for understanding why particular strategy or approaches are effective for him or her.

Indeed, the researchers choose this study to find out the perceived difficulties of K-12 Mathematics Curriculum among grade 7 students in Agusan National High School. It also include the factors affecting them in acquiring learnings in the new Mathematics curriculum. Furthermore, this study will help every teacher not only in Agusan National High School but also in all educators in the country to enhance Agusan National High School but also in all educators in the country to enhance the teaching strategies and approaches towards excellent teaching-learning performances.

Statement of the Problem

The main purpose of this study was to determine the perceived difficulties of K-12 Mathematics Curriculum in the grade 7 students of Agusan National High School.

Specifically, it aimed to answers the following questions:

1. What is the profile of the grade 7 students in terms of:
 - 1.1 Grade-VI math grade;
 - 1.2 types of school graduated in elementary;
 - 1.3 learning style; and
 - 1.4 study habits?
2. What are the teacher's teaching strategies and teacher's utilization of instructional materials as perceived by the grade 7 students in Agusan National High School?
3. What are the perceived difficulties among grade 7 students in the following math content areas:
 - 1.5 Numbers and number sense;
 - 1.6 Measurement;
 - 1.7 Geometry;
 - 1.8 Patterns and algebra; and
 - 1.9 Probability and statistics?
4. Do the student's profile, perceived teacher's teaching strategies and utilization of instructional materials that significantly influence the perceived difficulties of K-12 Mathematics Curriculum among grade 7 students?

Hypothesis

Based on the problem presented above, a hypothesis was formulated:

H₀₁: Students-teachers' factors and utilization of instructional materials do not significantly influence the perceived difficulties of K-12 Mathematics Curriculum in the grade 7 students of Agusan National High School.

II. Theoretical and Conceptual Framework of the Study

This study is anchored on the theory of Jerome Bruner about learning is an active and dynamic process in which learners construct new ideas or concepts based upon their current/past knowledge. A learner is a purposive participant in the knowledge getting process that selects structures, retains, and transforms information.

Moreover, this study was supported by the concept of K to 12 Basic Education Curriculum specifically on K to 10 Mathematics Curriculum. The adoption of the new curriculum (K-12) is said to enhance the quality of basic education in the country. This is in fact in line with Article XIV, Section 2(1) of the 1987 Philippine Constitution which states that "The State shall establish, maintain, and support a complete, adequate, and integrated system of education relevant to the needs of the people and society."

Additionally, the K to 10 Mathematics Curriculum provides a solid foundation for Mathematics at Grades 11 to 12. It has composed of five content areas which are: (1) Numbers and Number Sense; (2) Measurement; (3) Geometry; (4) Patterns and Algebra; (5) Probability and Statistics.

Numbers and Number Sense as a strand include concepts of numbers, properties, operations, estimation, and their applications. Measurement as a strand includes the use of numbers and measures to describe, understand, and compare mathematical and concrete objects. It focuses on attributes such as length, mass and weight, capacity, time, money, and temperature, as well as applications involving perimeter, area, surface area, volume, and angle measure. Geometry as a strand includes properties of two- and three-dimensional figures and their relationships, spatial visualization, reasoning, and geometric modelling and proofs. Patterns and Algebra as a strand studies patterns, relationships, and changes among shapes and quantities. It includes the use of algebraic notations and symbols, equations, and most importantly, functions, to represent and analyze relationships. Statistics and Probability as a strand is all about developing skills in collecting and organizing data using charts, tables, and graphs; understanding, analyzing and interpreting data; dealing with uncertainty; and making predictions about outcomes.

In which, these areas are being taught all at the same time as opposed to the discipline-based Mathematics in the old curriculum (Basic Education Curriculum). Moreover, each content areas consist different learning competencies that designed to meet the objectives of the K-12 Mathematics curriculum.

Indeed, this study anchored on the concept that the teacher and the students are the contributory factors influencing the difficulties of the students in the K-12 curriculum. This further theorized some specific variables under the teacher and students' factors such as students' profile consisting of Grade-VI math grade which implies the students' performance in math and types of school graduated in elementary; student's leaning styles; student's study habits; teacher's teaching strategy; and teacher's utilization of instructional materials as mainly conceived that these influenced the difficulties of the students in the five content areas with selected learning competencies in K-12 Mathematics curriculum. Thus, according to Santos (2007), we need to know about students experiences along the way- about the curricula, teaching and kind of student effort that lead to particular outcomes.

Research Paradigm

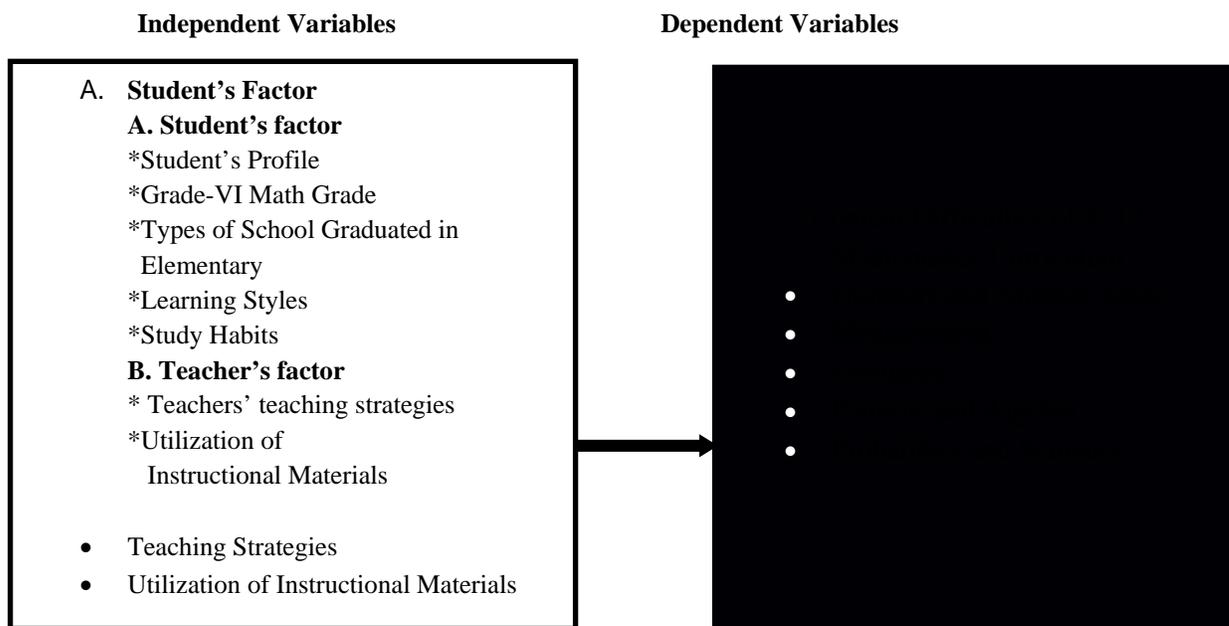


Figure 1. Schematic diagram showing the dependent and independent variables of the study.

III. Research Methodology

Research Design

The descriptive research design was used in this study in order to obtain the main objectives of the study. The descriptive method is basically a technique of quantitative description of the general characteristic of data elicited from the respondents. It served to present the appropriate information on the perceived difficulties of K-12 mathematics curriculum of the Grade 7 students.

Research Locale

This study was conducted in Agusan National High School located at the city proper of Butuan, Caraga Region, Philippines which is 550 meters from the Guingona Park. Perhaps, it takes only 3 minutes to travel through multi-cab or motorcycle from the park to arrive at the said school. The school cite was bounded on the west by Barangay Golden Ribbon; on the north by Butuan Central Elementary School; on the south on Duranggo street; and on the east by Barangay Agao. The figure 2 shows the Map of Agusan National High School.

Population and Participants of the Study

The respondents of this study were the Grade 7 students of Agusan National High School who were officially enrolled in the S.Y 2016-2017. The total population of Grade-VII students comprises with Science section, crack section, Heterogeneous section and

Special Program section is 2,221. Out of 2,221 grade 7 students, ten percent was taken for the sample size. Hence, selected 222 students were selected from heterogeneous section were taken as the sample of the study to answer the validated questionnaire.

Sampling Design

This study utilized convenience random sampling design. The researchers selected from the list of the grade 7 sections of Agusan National High School as guide to determine the heterogeneous section where the students are vary. From the heterogeneous section, the researchers randomly selected the 222 students to represent the ten percent of the total population of the said grade level or as the sample of the study.

Research Instrument

The questionnaire checklist was used as the research instrument of this study. The research instrument composed of three questionnaire checklist such as:

(1) Part I is the profile of the Grade 7 students in terms of Math grade in Grade 6 and types of school graduated in Elementary.

(2) Part II is about how much the students agree or disagree of each statement given in terms of:students' learning styles, students' study habits, teacher's teaching strategies and teacher's utilized instructional materials.

(3) Part III is about how difficult for the students is each of the question of K-12 Mathematics Curriculum in terms of the five content areas.

The participants were asked to choose their preferred response by checking the appropriate column that indicates their choice based on their personal feelings and decisions. The questionnaire had questions based on the selected learning competencies of each content area in the K-12 Mathematics Curriculum.

Validation and Reliability of the Research

The Three-questionnaire checklists was prepared by the researchers and submitted to the experts for validation purposes. It was then pilot test to grade 7 students twice from two different school. First in Butuan City School of Arts and Trade (BCSAT) and another in Los Angeles National High School. The results of both schools were subjected for reliability index using the Cronbach Alpha. The reliability index of 0.830 and 0.870 were obtained.

Data Gathering Procedure

Permission was secured from the school principal of Agusan National High School before administering the survey questionnaire. The researchers personally administered the distribution of questionnaire with the assistance of the respective advisers. During the actual distribution, the researchers gave a brief orientation to the respondents in order to obtain the accurate answers. After the brief orientation, the respondents were given 15 to 25 minutes to answer the survey questionnaire.

The retrieval of the questionnaire was done right after the respondent answered all the items or questions. The responses were scored, tallied and tabulated for statistical analysis.

Scoring and Quantification of Data

The following qualification scales were used in scoring and quantifying of data. These might serve as the basis for the interpretation on the result of the study.

1. Math Grade in Grade VI

Scale	Range	Interpretation
4	90-100	Outstanding
3	85-89	Very Good
2	80-84	Good
1	75-79	Poor

2. Types of School graduated in Elementary

Scale	Description
2	Private
1	Public

3. Students' Learning Styles

Numerical Rating	Verbal Description	Mean Ranges	Interpretation
5	Strongly Agree	4.51-5.0	Very High
4	Agree	3.51-4.50	High
3	Neutral	2.51-3.50	Moderate
2	Disagree	1.51-2.50	Low
1	Strongly Disagree	1.0 -1.50	Very Low

4. Students' Study Habits

Numerical Rating	Verbal Description	Mean Ranges	Interpretation
5	Strongly Agree	4.51-5.0	Very Good
4	Agree	3.51-4.50	Good
3	Neutral	2.51-3.50	Fairly Good
2	Disagree	1.51-2.50	Bad
1	Strongly Disagree	1.0 -1.50	Very Bad

5. Teachers' teaching strategies

Numerical Rating	Verbal Description	Mean Ranges	Interpretation
5	Strongly Agree	4.51-5.0	Very Competent
4	Agree	3.51-4.50	Competent
3	Neutral	2.51-3.50	Fairly Competent
2	Disagree	1.51-2.50	Incompetent
1	Strongly Disagree	1.0 -1.50	Very Incompetent

6. Teachers' utilization of Instructional Materials

Numerical Rating	Verbal Description	Mean Ranges	Interpretation
5	Strongly Agree	4.51-5.0	Very Adequate
4	Agree	3.51-4.50	Adequate
3	Neutral	2.51-3.50	Fairly Adequate
2	Disagree	1.51-2.50	Inadequate
1	Strongly Disagree	1.0 -1.50	Very Inadequate

7. Perceived Difficulties of K-12 Mathematics Curriculum of Grade-VII students in the five content areas

Scale	Verbal Description
5	Very Difficult
4	Difficult
3	Moderately Difficult
2	Slightly Difficult
1	Not Difficult

Statistical Treatment

The data gathered was compiled, sorted out, organized and tabulated. The same would be subjected to statistical treatment to facilitate the presentation, analysis and interpretation.

These following statistical tools were employed in the study.

1. Percentage Computation was used to determine the number of students in terms of academic performance specifically on math grade of the respondents during Grade-6 and the type of school they graduated in elementary. At the same time, the perceived difficulties in K-12 Mathematics Curriculum of grade 7 students in terms of the five content areas.
2. Weighted mean was used to determine the students' learning styles, students' study habits, teacher's teaching strategies and teacher's utilization of instructional materials that can contribute to the content difficulties of K-12 Mathematics.
3. Pearson Correlation was used to determine the significant influence of independent variable such as the students' profile of Math VI grade, learning style, study habits, teachers' teaching strategies, and utilization of instructional materials to the dependent variable such as the content difficulties of 5 content areas in the K-12 Mathematics Curriculum.

IV. Presentation, Analysis and Interpretation of Data

Figure 1. The Percentage Distribution of the Respondents' Math Grade in Grade VI

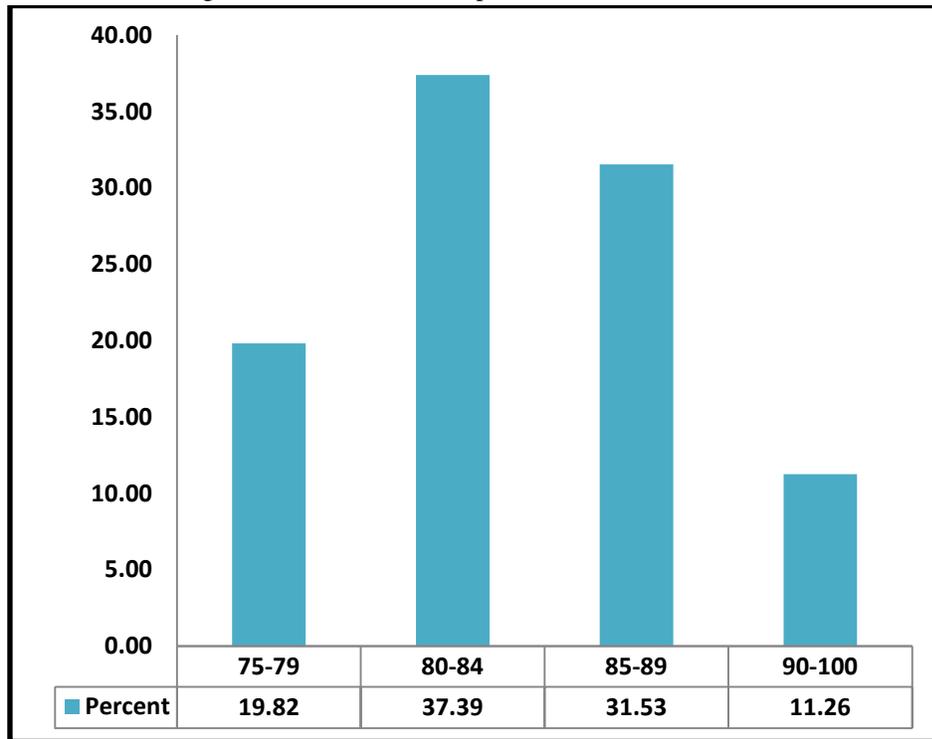
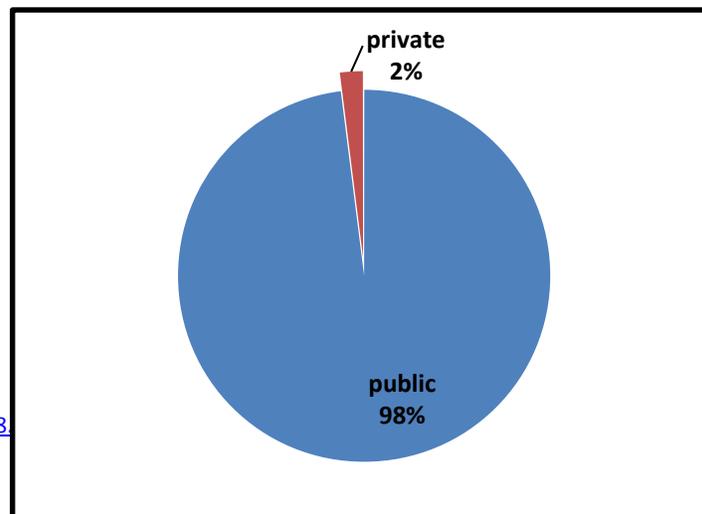


Figure 1 shows that there are 37.39 percent or 83 respondents who have math grade in grade VI from 80-84 that can be interpreted as good. However, there are only 11.26 percent or 25 of them who have the grade from 90-100 that can be interpreted as outstanding. This implies that most of the respondents of the study have good performance in mathematics on their previous grade and only few of them who have outstanding mathematics performance.

Figure 2. The Percentage School Graduated in



Distribution of Respondents' Elementary

Figure 2 shows that there are 98 percent or 218 respondents are graduated from public school and only 2 percent of them are graduated from private school. This means that majority of the respondents are graduated from public schools.

Table 1. Correlation Analysis between the independent variable and dependent variable

Factors	Statistic	Mathematical Competencies				
		Numbers and Number Sense	Measurement	Geometry	Patterns and Algebra	Probability and Statistics
Grade-VI Math Grade	Pearson Correlation	0.14	0.27	-0.07	0.24	0.20
	P-Value	0.03	0.00	0.33	0.00	0.00
Students' Learning Style	Pearson Correlation	0.19	0.31	0.11	0.26	0.18
	P-value	0.00	0.00	0.03	0.00	0.00
Students' Study Habit	Pearson Correlation	0.19	0.21	0.16	0.17	0.11
	P-value	0.00	0.00	0.00	0.00	0.03
Teacher's Teaching Strategies	Pearson Correlation	0.26	0.33	0.16	0.36	0.12
	P-value	0.00	0.00	0.02	0.00	0.08
Teacher's Utilized Instructional Materials	Pearson Correlation	0.25	0.34	0.13	0.32	0.17
	P-Value	0.00	0.00	0.06	0.00	0.01

*Interpretation of Pearson correlation (r): below-0.04= low correlation; 0.41-0.69= moderate correlation; 0.70- above= high correlation

*P- Value Interpretation: less than 0.05= significant; greater than 0.05= not significant

Table 10 shows the correlation analysis between the independent variables and the dependent variable. As shown in the table, the respondents' math grade in Grade VI have positive low correlation to all mathematical competencies except geometry. In the same manner, it have significant influence to all mathematical competencies except geometry. This implies that the perceived difficulties of all the mathematical competencies, except geometry, of the grade 7 students are lowly affected by the students' mathematical intelligence determined by their math grade in Grade VI.

Moreover, students' learning style have positive low correlation to all mathematical competencies. Also, it have significant influence to all mathematical competencies. This implies that the perceived difficulties of all the mathematical competencies of the grade 7 students are slightly affected by the different ways of learning of the students determined through their learning styles. Sulit

(2005) states that students can learn any subject matter when they are taught with methods and approaches responsive to their learning style strengths.

Similarly, students' study habit have positive low correlation to all the mathematical competencies. It also have significant influence to all mathematical competencies. This indicates that the study habit of the students is a contributory factor to the perceived difficulties of all the mathematical competencies of the grade 7 students.

Moreover, teacher's teaching strategies have positive low correlation to all the mathematical competencies except probability and statistics. In the same case, it have significant influence to all mathematical competencies except probability and statistics. This signifies that the perceived difficulties of all the mathematical competencies, except probability and statistics, of the grade 7 students are lowly affected by various teaching strategies practiced by the teacher. According to Duze (2012), the effectiveness of the curriculum relies on the teacher's knowledge about the curriculum and his/her teaching strategies.

Lastly, teacher's utilized instructional materials have positive low correlation to all mathematical competencies except geometry. Then, it also have significant influence to all mathematical competencies except geometry. This implies that the perceived difficulties of all the mathematical competencies of the grade 7 students are slightly affected by the utilization of instructional materials of the teacher.

Therefore, the null hypothesis which states that students-teachers' factors and utilization of instructional material do not significantly influence the perceived difficulties of K-12 Mathematics Curriculum in the grade 7 students of ANHS is rejected. Indeed, Onwumere (2009) states that every individual is unique and learns in particular way. This implies that any teaching which does not take into account student limiting factors for learning rarely succeeds. Teachers who understand the learning needs of their students are more empowered to provide the kind of instruction their students need. Knowing why a student is struggling to learn provides a basis for understanding why particular strategy or approaches are effective for him or her. Consequently, this signify that the students, teachers and utilization of instructional materials are contributory factors that significantly influence the perceived difficulties of K-12 mathematics curriculum in Grade 7 students of ANHS.

V. Conclusions

Based on the finding of this study the following conclusions are drawn.

The Grade 7 students in Agusan National High school are found that their performance in Mathematics are good based on their Math grades in Grade 6 and majority of them are graduated in elementary at public schools. Thus, the respondents have a good mathematical intelligence and they have deep understanding in the concepts of mathematics.

Also, there is no problem of their preferable learning styles since they are multi-learners and they have good study habits as well. Thus, highly different learning styles and good study habits have influenced the perceived difficulties in the different content areas in K-12 math. In addition, the teachers are competent in their teaching strategies which means that they practice various strategies in teaching and adequate in utilizing instructional materials particularly in hand-outs' photocopy from the textbook.

Finally, the difficulty of K-12 Mathematics Curriculum in the five (5) content areas with selected learning competencies is perceived with having different levels of difficulties. In which, Number and Number Sense, Measurement and Geometry are slightly difficult while Patterns and Algebra and Probability and statistics are moderately difficult, that is, it is significantly influenced by the students- teachers' factors and utilization of instructional material such as students' Math grade in their Grade-VI, student's leaning styles, student's study habits, teachers' teaching strategy; and teacher's utilized instructional materials.

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RFP (Request for Proposal) Consolidation using RPA (Robotic Process Automation) for Smart Cities

Dr Ramanathan Mohan* Senior Manager, Technology Innovation Centre, Larsen & Toubro Smart World & Communications.

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Abstract- Smart Cities with Middleware and RPA becomes a strong research area. The reason is the ability of middleware technologies with RPA technologies to integrate and solve problems to build a smart city. This paper aims in providing a solution framework using RPA for smart cities.

Index Terms- Middleware, Integration, Smart Cities, Robotic Process Automation, ICC (Integrated Command and Control Center), Request for Proposal, Artificial Intelligence, Machine Learning, Deep Learning, L&T (Larsen and Toubro), SWC(Smart World and Communications).

I. INTRODUCTION

The term RPA defines Robotic process automation (or RPA or RPAAI) is an emerging form of business process automation technology based on the notion of software robots or artificial intelligence (AI) workers. In a typical business set up / Smart City solution provider (MSI) the Solution Architects team and the Design Engineers Team are busy responding to the RFP (Request for Proposal). There is a dire need to collect and collate the humongous information or requirements.

II. IMPORTANCE OF RPA & MIDDLEWARE IN CURRENT MANUAL RFP CONSOLIDATION

Given the fact that middleware adds a lot of integration value, there has to be a lot of effort that goes in each architectural framework. The framework need not be technical. It can be at high level over all solution architecture. Every RFP has issues and challenges in their requirements and complexities. It is up to the Design Consultants, Engineers and Solution Architects to understand, discuss, elaborate, present and articulate the benefits of their solution. They are left with no help than to read the RFP that would go up to 500 pages, that too working on multiple RFP with the given tight deadlines to stitch the solution and paint the big picture. All these are manual and prone to errors.

III. ISSUES AND CHALLENGES IN MANAU PROCESS

- STEP 1: Check & Validate the Information: The information is exhaustive and it is needed to carefully check and attention to details is always needed. There is a need to

double check the information that are linked and tagged with other sections for integration. The information is then shared with other Design Engineers that are involved for arriving at the overall solution. It has to be further validated to check if all information related to a particular section of the RFP is captured. If there is any ambiguity, then it has to be raised for the clarification.

- STEP 2: Check & Validate the Generic Architecture: Once the information is collated and validated in the excel sheet, the next steps are to arrive at a Generic Architecture. The Generic Architecture could contain, Overall Landscape Architecture, ICC Architecture – Core & Complex, Unified Architecture, Flow Model Architecture and Identity Architecture. This is a vital step and the input for this the checklist of information that is collected in previous step.
- STEP 3: With these Architectures, the next steps is to reach out to different vendors that comply to the solution
- STEP 4: Evaluate the different vendors
- STEP 5: Select the perfect match of vendor for the requirements

IV. THE ATUOMATED SOFTWARE ROBOT SOLUTION

- The solution is to arrive at the Solution Document AUTOMATICALLY that could be possible by completing Steps 1 & 2 described in “Issues and Challenges”. RPA software could provide the Smart city specific completed checklist to start with.
- To automate this solution, RPA software can be utilized. Some of the RPA stack/vendors can be utilized as below;
 - Blue Prism
 - UI Path
 - Automation Anywhere
 - Black Line
 - And the list goes on.

- The solution should capture all the needs of each Design Engineer involved in different sections/discipline/areas of expertise. It has to cover the below aspects:
 - ❖ Provide the completed smart city specific data captured in checklist.(step 1)
 - ❖ Validate the checklist/information by complete automatic scanning of the file (step 1)
 - ❖ Send out emails to the relevant stakeholders.
 - ❖ Manage the history of discussions/Blog with stakeholders
 - ❖ Prepare the Generic Architectures (step 2)
 - ❖ Validate the Architectures with stakeholders with history of blogs.
 - ❖ Provide next steps for Vendor Evaluation
 - ❖ Generate Vendor Stacks with optimum consideration along Technical needs
 - ❖ Choose and Pick the Vendors with stakeholder approval and confirmation
 - ❖ Provide justification for the selection
 - ❖ Provide Executive summary and collation of the Solution Document

V. CONCLUSION

Based on the RFP requirements and complexities, we need to address problems with competencies to build a framework for suggesting the successful software bot architecture for smart Cities project. Using such approach will help a futuristic framework for Smart City solutions. The level of details and accuracy in the final solution will resonate with the implementation of the solution post bid. To enhance the winning ratio and roll out a successful solution, Automation of manual job is needed in pre bid stage. Apart from the Bid stage, RPA will have key role in other aspects of Smart City ICC (Integrated Command and Control Center) platform architecture as well clubbed with Cognitive Analytics using Artificial

Intelligence, Machine Learning and Deep Learning models.

VI. IMPLICATIONS

The advent of RPA bring in the though process that it will affect the existing workforce. The truth is that it will aid the workforce and increase their productivity if implemented properly. This will make workforce life happy and in turn make the organization perform well. If the workforce is happy and effective, organization will become efficient and achieve their goals.

VII. SCOPE

Though this approach is on RFP, the scope of RPA for this paper is on smart city projects. This can be used across verticals and business areas as long as the idea is nurtured and implemented in right way. This paper will enable the readers to think through their current organization issues and find a solution with RPA.

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AUTHOR

Author – Dr Ramanathan Mohan, Senior Manager, L&T SWC, Chennai.

Correspondence–

Dr Ramanathan Mohan,

Email: raum79@gmail.com,

Mobile: 00 91 9159231713

LinkedIn: <https://www.linkedin.com/in/ramanathan-m-64a9764/>

Assessment of Concentrations and Potential Exposure Pathways for Physiochemical Parameters near Unengineered Dumpsite in Port Harcourt, Nigeria

Eseyin, Olushola O. Udom, G. J Osu Charles I.

Institute of Natural Resources, Environment and Sustainable Development, University of Port Harcourt, Rivers State. Nigeria.

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ABSTRACT

This study assessed the concentrations and potential exposure pathways for physiochemical parameters near unengineered dumpsite in Port Harcourt, Nigeria. Cross sectional study was conducted on leachates, borehole water (from less than 1 km and another about 10 km away from the dumpsite), soil and two edible plants (Pawpaw and Potatoes). The physicochemical parameters studied include pH, Total Dissolved Solids (TDS), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Electrical Conductivity (EC), Nitrate, Phosphate, Sulphate, Chlorine and heavy metals (namely Cd, Pb, Zn, Fe, and Cu). The result showed that leachate at the two dumpsites have higher physiochemical characteristics than the borehole water, and that there are biological activities which correspond to the acid phase of anaerobic degradation. TDS was higher at the water samples closer to the dumpsites than the one farther. The pH value ranged from 6.2 – 7.40; and are consistent with WHO and NSDWQ. The pH recorded in the borehole waters shows that biological activities have decreased as the water gets to the ground level. The result shows that higher proportion of metals was present in the soil than borehole water. The result shows that most of the underground water meets the minimum quality of international standard WHO (World Health Organisation) and NSDWQ (Nigerian Standard for Drinking Water Quality); though lead was recorded above the minimum drinking water standard in the borehole water near Choba dumpsite; with concentration 0.2 mg/l compared to the maximum standard of 0.01mg/l. The concentrations of contaminants were found to be higher around the dumpsites (leachates and soil) than the one farther from it (borehole waters), which shows that contaminations drop with increase in distance from the dumpsites. Analysis of the leachates, soil, edible plants and borehole waters showed possible gradual movement of contaminants, with concentrations decreasing as we move from the leachate to the soil (from where plants absorb metals), nearby borehole and distant borehole water. This study shows that there is high pollution around the unengineered dumpsites that can lead to high health risk in Port Harcourt, Rivers State. Nigeria.

Keywords: groundwater, pollution, leachate, unengineered dumpsites

INTRODUCTION

Some habitable parts of the earth surface with accumulated solid wastes are called refuse dumps but a designated place for dumping is known as dumpsites. Unengineered dumpsite is a disposal site where there is indiscriminate deposit of solid waste with either no or limited engineering measures (such as liner system) to control the operation and to protect the environment. Improper waste management processes in developing countries results to the development of unengineered dumpsites of different materials ranging from perishable food wastes to hazardous chemicals which pollute the environment. Landfilling is one of the less expensive methods of disposal of solid waste playing an important role in integrated solid waste management (Peng, 2013). The emitted liquid from dumpsites known as 'Leachate' may contain several organic and inorganic contaminants which have detrimental effects on water, soil and environment (Kolsch and Ziehmman, 2004). Proper treatment and safe disposal of the leachate is one of the major environmental challenges worldwide especially in developing nations (Butt *et al.*, 2014; Mukherjee *et al.*, 2014).

Within a landfill, complex sequence of physical, chemical, and biologically mediated events occurs as have been reported by Pastor and Hernández (2012) that degrade and transform the wastes. As water percolates through the solid waste, contaminants are leached from the solid waste. The mechanism of contaminant removal outlined by Aziz *et al.*, (2010); Eggen *et al.*, (2010) and Hennebert *et al.*, (2013) include leaching of inherently soluble materials, leaching of soluble biodegradation products of complex organic molecules, leaching of soluble products of chemical reaction and washout of fines and colloids.

Municipal landfill leachate is a complex effluents which contains dissolved organic matters, inorganic compounds such as ammonium, calcium, magnesium, sodium, potassium, iron, sulphates, chlorides and heavy metals such as cadmium, chromium, copper, lead, zinc, nickel and xenobiotic organic substances (Christensen *et al.*, 2001). This leachate accumulates at the bottom of the landfill and percolates through the soil (Mor *et al.* 2006). Groundwater pollution is mainly due to the process of industrialization and urbanization that has progressively developed over time without any regard for environmental consequences (Longe and Balogun, 2010).

Rapid population growth and development in Nigerian states has resulted in environmental health hazards (Adefemi and Awokunmi, 2009). Wastes are generated from human activities and in most cases not properly managed in most Nigerian cities (Aurangabadkar *et al.*, 2001; Adefemi and Awokunmi, 2009). Population growth and economic development lead to enormous amounts of solid waste generation by the dwellers of urban areas. This leads to low environmental quality which accounts for 25% of all preventable ill health in the world (WHO, 2004). In most cases, wastes are collected and disposed in uncontrolled or unengineered dumpsite sites near residential buildings. These wastes are heaped up and/or burnt, polluting the environment (Akpan, 2004; Uffia *et al.*, 2013). Waste generally leads to proliferation of pathogenic microbes and heavy metals which can transfer significantly to the environment (Adefehinti, 2001). Leachates from dumpsites constitute a source of heavy metal pollution to both soil and aquatic environments (Ali and Abdel-Satar, 2005). This may have serious effects on soils, crop and human health (Bahnasawy *et al.*, 2011). The quality of underground water is compromised by the indiscriminate dumping of waste in the environment and contamination by leachate. (David and Oluyeye, 2014).

The collection, transport, treatment, and disposal of solid wastes have become a relatively difficult problem to solve for those responsible for their management (UNEP, 2005), which has manifested in the form of piles of indiscriminately disposed heaps of uncovered waste and illegal dumpsites along major roads and at street corners in cities and urban areas. Presently, the waste generated from Port Harcourt metropolis is disposed of directly into random pits without adequate handling and treatment (RSESA, 2013). Such mode of disposal can cause serious threat to the environment especially those living around them.

Many unengineered dumpsites located in various parts of Port Harcourt and its environment are located at or close to streams, valleys, open fields, water lands and in abandoned pits. Wastes generated and gathered at source are disposed of in communal bins or communal collection points (that are spread out at different location across the city) stipulated by the Government. In Port Harcourt, refuse is generated from domestic, commercial and industrial sources. The rate of generation has been steadily increasing and will likely continue to do so in future with the rapid increase of population and industrial activities in the city. Heaps of these wastes are conspicuous on roads and public places, clogging drains and contaminating water sources close to dump sites.

When solid wastes are released into improperly designed environment, it can cause several impacts on human and the environment. Most countries do not have any specific technique of managing hospital and clinical wastes. So, they are mixed with MSW and pose a threat to health of human population and surrounding environment (Pattnaik and Reddy, 2009). Once leachate is formed, it migrates downward through the unsaturated zone of the groundwater until it reaches the saturated zone. Several forces may act on or react with the migrating leachate, resulting in changes of chemistry and a general reduction of strength from the original release. These forces are physical (filtration, sorption, advection, and dispersion), chemical (oxidation-reduction, precipitation-dissolution, adsorption-desorption, hydrolysis, and ion exchange), and biological (microbial degradation).

Contaminants in groundwater are largely soluble compounds and microorganisms (Aderiye *et al.*, 1992; Udoessien, 2004). Heavy metals are not commonly found in groundwater, their presence is largely as a result of environmental contamination (Bahnasawy *et al.*, 2011). They get accumulated and affect different organs and caused several ailments in the body. Their amount in the water depends on pH, temperature, water hardness, standing time of the water among other factors (IPCS, 2003; WHO, 1997). Urban wastes constitute a large source of pollution and have a significant impact on the ecosystem (Adebayo *et al.*, 2007; Edema *et al.*, 2001; Pirsahab *et al.*, 2013).

Generally, dumping in Port Harcourt is unrestricted to different sources of wastes; which ends up in unengineered dumpsites. Dumpers do have access to the site at any time of the day, which increase dumping of restricted materials, such as car batteries and metals. Scavengers have free access to the dump, and they scatter the waste to recover valuable material. Some scavengers even pitch their tent in and around the unengineered dumpsites. Like many cities in Nigeria, Port Harcourt is faced with the problems of improper collection, handling and disposal of domestic wastes.

Okafor and Onwuka (2013) reported that the concern over soil contamination stems primarily from health risks, from direct contact with the contaminated soil, vapours from the contaminants, and from secondary contamination of water supplies within the soil. High potential risk may result from infiltration of hazardous chemicals in the soil into groundwater aquifers used for human consumption. Agriculture in these areas faces major problems when pollutants and heavy metal are transferred into crops and subsequently into the food chain. Industrial or man-made concentrations of naturally-occurring substances, such as nitrate and ammonia associated with livestock manure from agricultural operations have also been identified as health hazards in soil and groundwater (USEPA, 2002). Heavy metals can be found in dumpsite leachate, soil and borehole water.

A key route for entry of metals into the food chain is via uptake by plants from the soil or as a result of accumulation in tissues of aquatic animals. Approaches to evaluating the fate and distribution of contaminants in ecosystems are discussed by Markert (1993), Ross and Kaye (1994), and Walker *et al.* (1996), who also outline biomonitoring procedures. Analytical techniques are also detailed in Stoeppler (1992). Tessier and Turner (1995) specifically address the chemistry and bioavailability of trace metals in aquatic systems. Uptake by plants is affected by soil pH (Alloway 1995). Much of what is taken up is held in the roots, which may minimise implications for the food chain from foliage or seed crops. Many plants demonstrate tolerance to those metals they absorb, and cultivars with extreme tolerance are now available in commercial quantities for use in reclamation or decontamination work. Some species hyper-accumulate trace metals, making them problematic food sources, but giving them potential value as indicator species for monitoring programmes or as bioaccumulators during phytoremediation programmes (Treshow 1984, Markert 1993, Farago 1994, Ross & Kaye 1994, Saxe 1996, Brooks 1998). Material harvested from such species used in remediation work will need either to be incinerated or to go to secure landfill.

The potential exposure pathways are dumpsites, leachates, groundwater, air, soil and (locally produced) edible food. Exposures to the local population could be ingestion, inhalation or through the skin (trans-dermal). Some exposure of the wider population might occur through eating food produced near landfill site.

MATERIALS AND METHODS

Cross-sectional study of selected unengineered dumpsites was conducted in Port Harcourt, Rivers State to assess the physiochemical characteristics in leachate, groundwater soil and plant uptake near unengineered dumpsite in Port Harcourt, Nigeria. Port Harcourt is the capital and largest city of Rivers State, Nigeria. It is located between longitude $7^{\circ} 00'$ and $7^{\circ} 15'$ East of the Greenwich meridian and Latitude of $4^{\circ} 30'$ and $4^{\circ} 47'$ North of the equator. It is bounded on the Eastern and Western parts by meandering creeks; and to the southern part by Bonny River and mangrove swamps. The average temperature shows little variation throughout the year.

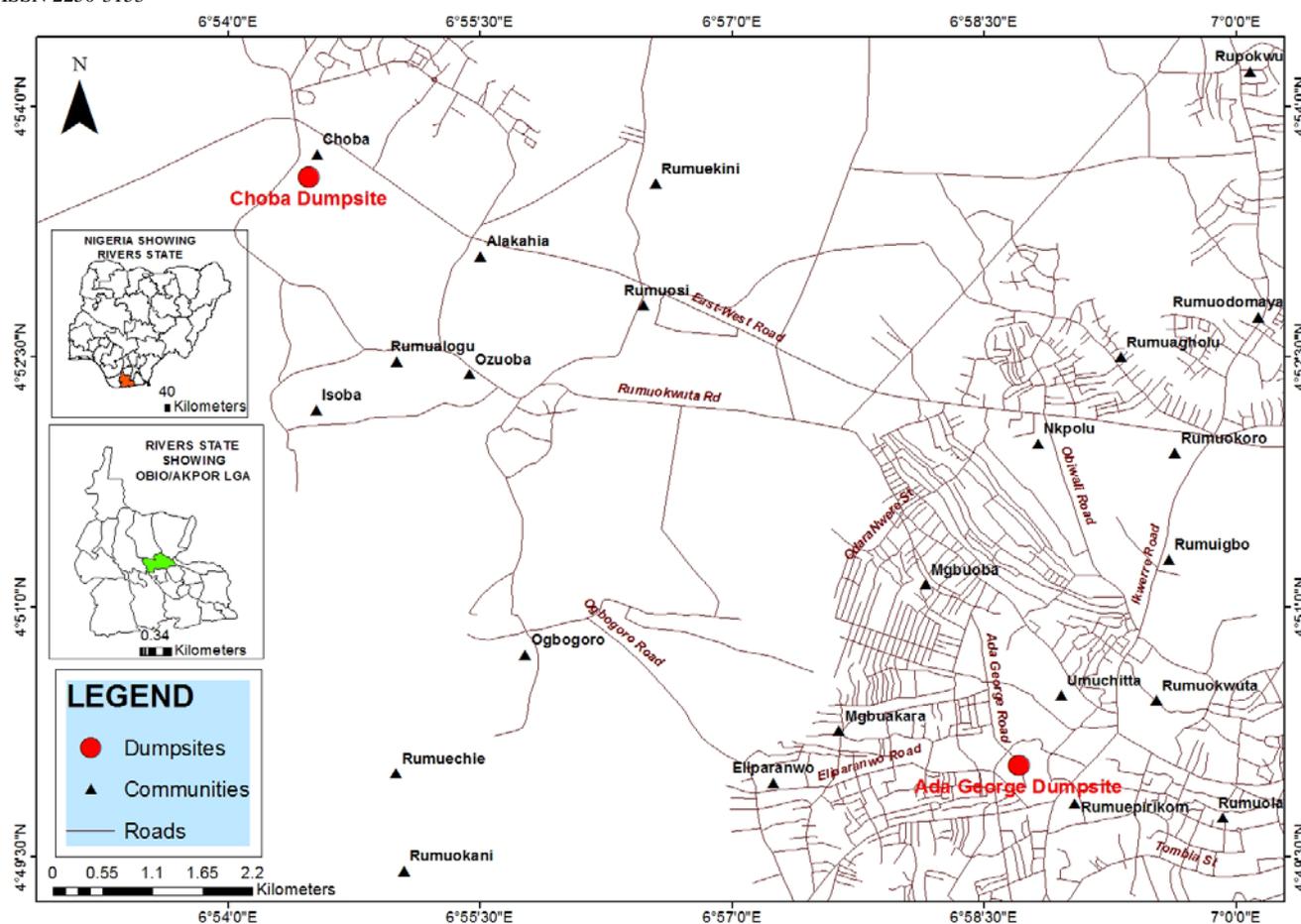


Figure 1: Sectional Map of Port Harcourt, Rivers State, Nigeria showing the location of the Dumpsites

Leachate, borehole water, soil, edible plant, and control borehole water (about 10 km away from the unengineered dumpsites) samples were collected from unengineered dumpsites for laboratory analysis. Attempts were made to minimize changes in the chemistry of the samples. Preservation methods for the samples that are used generally include pH control, refrigeration and protection from light. Sampling plan was coordinated with the laboratory so that appropriate sample receipt, storage, analysis, and custody arrangements will be provided. All physicochemical parameters were determined based on American standard methods for examination of water and wastewater (APHA, 2005). The available standard procedures and apparatuses were used.

RESULTS AND DISCUSSION

REPRESENTATION OF DATA

Physicochemical parameters and characteristics for the soil, leachate, borehole and edible plants around the dumpsite were determined in the Laboratory. Table 1 displayed average physicochemical characteristics at the two dumpsites.

Table 1: General Average Results

Parameter	L1	W1a	W1b	S1	Paw 1	Pot 1	L2	W2a	W2b	S2	Paw 2	Pot 2
Cd	12.60	0.040	< 0.001	9.50	0.94	0.60	< 0.01	< 0.001	< 0.001	< 0.01	< 0.01	< 0.01
Pb	19.50	0.20	< 0.001	16.40	1.60	2.30	< 0.01	< 0.001	< 0.001	< 0.01	< 0.01	< 0.01
Zn	106.70	0.90	0.60	76.30	6.40	11.60	0.95	0.008	0.006	22.14	18.11	9.30
Fe	168.30	11.30	6.40	146.70	16.30	3.40	94.80	2.10	1.60	89.60	6.10	1.30

Cu	94.20	0.09	0.03	63.40	3.14	4.50	46.30	0.21	0.10	40.10	1.30	0.50
BOD	11,015.60	< 0.01	< 0.001				170.56	< 0.001	< 0.001			
COD	19,670.10	< 0.001	< 0.001				341.1	< 0.001	< 0.001			
TDS	9760	6.60	4.70				168.3	15.10	3.40			
pH	6.40	6.70	6.90				6.20	7.40	7.10			
EC	2040.1	3.60	7.10				69.30	2.10	1.60			
NO ₃ ⁻	998.60	4.70	0.80	246.10	1.60	0.95	21.59	1.84	3.14	13.18	0.05	0.10
PO ₄ ⁻	169.30	0.10	0.07	17.60	1.20	0.80	8.30	< 0.01	< 0.01	3.19	0.12	0.24
Cl ⁻	670.40	11.30	4.60	130.60	< 0.01	< 0.01	392.3	9.94	3.98	39.76	< 0.01	< 0.01
SO ₄ ²⁻	267.50	0.05	< 0.001	103.40	0.60	3.12	83.60	0.01	< 0.001	68.70	0.90	1.60

Where W1a = Borehole water near Choba dumpsite, W1b = Borehole water 10 km away, from Choba dumpsite, W2a = Borehole water near Ada-George dumpsite, W2b = Borehole water 10 km away from Ada-George dumpsite, S1 = Soil sample from Choba dumpsite, S2 = Soil sample from Ada-George dumpsite, Paw 1 = Pawpaw plant from Choba dumpsite, Paw 2 = Pawpaw plant from Ada-George dumpsite, Pot 1 = Potato plant from Choba dumpsite, Pot 2 = Potato from Ada-George dumpsite, L1 = Leachate from Choba dumpsite, L2 = Leachate from Ada-George dumpsite

BOREHOLE WATER AND LEACHATE SAMPLE RESULTS

Leachate sample collected is black in colour. Physiochemical characteristics, anion, and metals were analysed from the collected samples. High concentration of pollutants prevailed in the leachate. Average concentrations of leachate and water samples collected from the Choba and Ada-George dumpsites are presented in table 2.

Table 2: Average Physiochemical properties of Leachate and Borehole water samples

Parameters	L 1	L 2	W1a	W1b	W2a	W2b
BOD	11,015.60	170.56	< 0.01	< 0.001	< 0.001	< 0.001
COD	19,670.10	341.1	< 0.001	< 0.001	< 0.001	< 0.001
TDS	9760	168.3	6.60	4.70	15.10	3.40
pH	6.40	6.20	6.70	6.90	7.40	7.10
EC	2040.1	69.30	3.60	7.10	2.10	1.60

Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD): The result shows that leachate generally has higher physiochemical characteristics than the borehole water. Higher physiochemical characteristics were recorded in L1 than L2. BOD and COD have negligible/not observed results of approximately 0.001 mg/l in the borehole waters; both at the dumpsites and about 10 km away from the dumpsites (Table 2). Chofgi *et al.*, 2004 reported that young leachates are more polluted than the mature ones where BOD may reach up to 81,000 mg/l for young and 4200 mg/l for mature leachates. BOD recorded in L1 was 11,015.60 mg/l, and L2 was 170.56 mg/l. According to Chofgi *et al.*, 2004, the two dumpsites sampled are relatively matured dumpsites, with L2 more matured than L1. COD recorded in L1 was 19,670.10 mg/l, and L2 is 341.1 mg/l. Bashir *et al.*, 2009 stated that BOD/COD ratio in young landfill, where biological activity corresponds to the acid phase of anaerobic degradation, reaches values of 0.85. From the result obtained, BOD/COD ratio is 0.56. With reference to Bashir *et al.*, 2009, the dumpsites studied is not too old as the BOD/COD ratio is 0.56 greater than 0.1. This shows that there are biological activities which correspond to the acid phase of anaerobic degradation. Higher BOD and COD in L1 than L2 indicates that L1 has higher organic strength than L2 (Zgajnar *et al.* 2008). The low values of BOD in the borehole water may be as result of dilution caused by heavy rains during the period samples were collected. Chofgi *et al.*, 2004 also confirmed that old landfills produce stabilized leachate with relatively low COD and low biodegradability (BOD:COD ratio < 0.1).

Total Dissolved Solids (TDS): L1 has average TDS of 9760 mg/l, and L2 168.3mg/l. TDS was higher at the water samples closer to the dumpsites than the one farther; and the one in L1 higher than L2 shows that there are more inorganic material in L1 than L2. The result shows that L1 has more anaerobic activities than L2. This may be as a result of some dissolved components or composition and water content of the waste. Average TDS in W1a, W1b, W2a, and W2b are 6.60, 4.70, 15.10, and 3.40 respectively, which shows a downward trend from the figures obtained in their respective leachates. This shows reduction in dissolved substances as we move from the leachate to the borehole water.

Hydrogen ion Concentration (pH): The pH value for leachate samples from the two dumpsites ranges from slightly acidic to neutral (L1 has pH 6.40, while L2 has pH 6.20). Although pH usually has no direct impact on consumers, it is one of the most important operational water quality parameters, which influences other water parameters (WHO, 2011). The pH recorded in the borehole waters tends to neutral. The average values of borehole water concentrations are W1a (6.70), W1b (6.90), W2a (7.40) and W2b (7.10). This shows that biological activities have decreased as the water gets to the ground level, and there is gradual increase in alkalinity of the water as we move away from the dumpsite.

Electrical Conductivity (EC): Electrical conductivity (EC) of water is a reflection of the quantity of ionic constituents dissolved in it. The obtained conductivity ranges from 1.6 S/cm to 7.1S/cm for borehole water samples, while the leachate water samples varied from 69.30 S/cm to 2040.1 S/cm. The high level of electrical conductivity in the leachate may be attributable to the bedrock materials around the vicinity of the dumpsite. It may be high if the bedrock material cannot limit the percolation of leachates from the refuse dumpsite into the groundwater. A similar trend was recorded in the value of total dissolved solids in the water bodies. According to (WHO, 2011) high level of TDS may be responsible for reduction in the palatability of water, inflict gastrointestinal inconveniences in human, may cause laxative effect particularly upon transits and may be objectionable to consumers.

Metals in Borehole Water, Leachate and Soil

Table 3: Average Concentration of Metals (mg/L) in Borehole water, Leachates and Soil

Variables	W1a	W1b	W2a	W2b	L1	L2	S1	S2
Cd	0.040	< 0.001	< 0.001	< 0.001	12.60	< 0.01	9.50	< 0.01
Pb	0.20	< 0.001	< 0.001	< 0.001	19.50	< 0.01	16.40	< 0.01
Zn	0.90	0.60	0.008	0.006	106.70	0.95	76.30	22.14
Fe	11.30	6.40	2.10	1.60	168.30	94.80	146.70	89.60
Cu	0.09	0.03	0.21	0.10	94.20	46.30	63.40	40.10

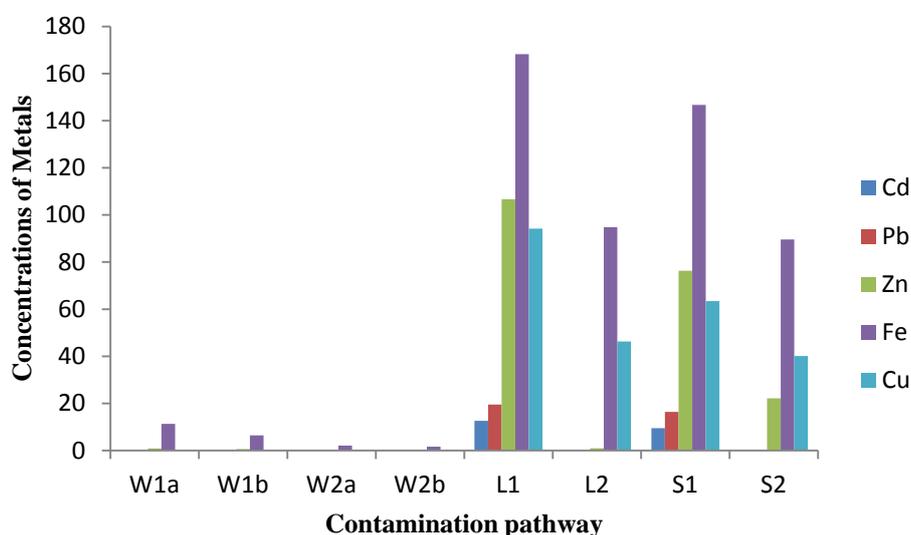


Figure 2: Concentration of Metals (mg/L) in the Borehole water, Leachates and Soil

Table 3 and figure 2 shows that Leachate in Choba has Cd and Pb concentrations of 12.60 mg/l and 19.50 mg/l respectively; and none/negligible in Ada-George dumpsite. Traces of Cd and Pb (0.04mg/l and 0.2mg/l respectively) were found in the borehole close to Choba dumpsites (W1a). Cd and Pb were not detected in other borehole samples. This could be attributable to the fact that Choba dumpsite receives more batteries, florescent lambs, petroleum compounds and photographic materials than Ada-George dumpsite. Because traces of Cd (0.04) and Pb 0.20) were recorded in the borehole water close to the Choba dumpsite, it is possible that the Cd and Pb has travelled to the borehole water and are yet to get to the distant borehole water. Fe

has the highest recorded concentrations of metal in both leachate (168.30 mg/l) and borehole samples (W1a = 11.30 mg/l). It was followed by copper and zinc; while cadmium has the lowest value. Choba dumpsite with the highest figure in both leachate and borehole samples therefore likely receives more waste from iron and steel scrap or metallic waste than Ada-George dumpsite. Traces of Zn and copper indicate that batteries and florescent lamps must have contaminated the dumpsites. This result shows that there is a downward trend in the concentrations of metals from leachates to the borehole water near the dumpsites, and then the borehole water farther from the dumpsites; with Fe more predominant than other metals. Choba dumpsite receives more metallic wastes than Ada-George dumpsites. Cd and Pb are lower, indicating fewer dumping of batteries, florescent lamps and photographic materials. This is a possible indication that most metals and metallic substances are still held bound in the dumpsites and are released gradually into the groundwater. The low value of heavy metals obtained may be attributed to the dumping of mainly municipal wastes and small percentage of industrial wastes. Heavy metals tend to be immobile in the waste or waste-rock interface due to redox controlled reaction (Yanful *et al.*, 1988).

Table 4: Average Concentration of Metals (mg/kg) in Edible Vegetables

Parameters	Pawpaw 1	Potatoes 1	Pawpaw 2	Potatoes 2
Cd	0.94	0.60	< 0.01	< 0.01
Pb	1.60	2.30	< 0.01	< 0.01
Zn	6.40	11.60	18.11	9.30
Fe	16.30	3.40	6.10	1.30
Cu	3.14	4.50	1.30	0.50

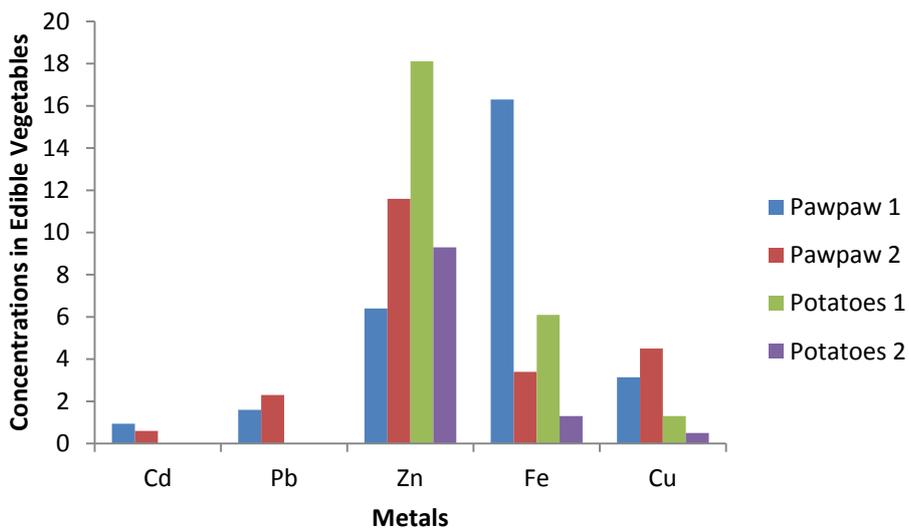


Figure 3: Concentration of Metals (mg/kg) in Edible Plants

Table 4 shows that all the plants have taken up one form of metals or the other. Zn and Fe are the most dominant metals absorbed by the edible plants. Fe has the highest concentrations in pawpaw (16.3mg/kg) in Ada-George dumpsite, while Zn has the highest concentrations in pawpaw (18.11mg/kg) in Choba dumpsite. Pawpaw at Ada-George dumpsite do not have traces of Cd and Pb. Table 1 shows that the average concentrations of heavy metals in the edible plants are less than that in the soil. The result obtained shows possible absorption of some of the metals from the soil and or leachate, while the rest still abound in the soil.

Anion Concentration in Borehole Water, Leachate and Soil

Table 5: Average Concentration of Anions in Leachate, Borehole water and Soil

Variables	L1	L2	W1a	W1b	W2a	W2b	S1	S2
NO ₃ ⁻	998.60	21.59	4.70	0.80	1.84	3.14	246.10	13.18
PO ₄ ⁻	169.30	8.30	0.10	0.07	< 0.01	< 0.01	17.60	3.19

Cl ⁻	670.40	392.3	11.30	4.60	9.94	3.98	130.60	39.76
SO ₄ ²⁻	267.50	83.60	0.05	< 0.001	0.01	< 0.001	103.40	68.70

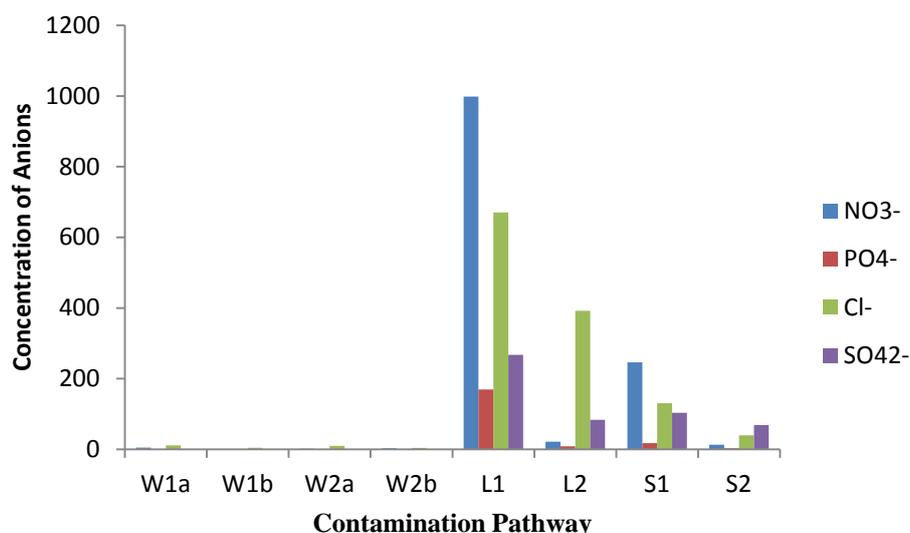


Figure 4: Concentrations of Anion in Borehole water, Leachate and Soil

Table 5 and figure 4 shows that the concentration of anions was highest in Choba leachate and soil than the corresponding Ada-George dumpsite. Choba dumpsites also have more concentrations in the underground water than Ada-George dumpsite. The higher rate of chlorine in Ada-George dumpsites leachates (670.40 mg/L) compared to Choba dumpsites (392.3 mg/L) correspond with the higher rate in the borehole water found in the respective dumpsites (11.30 mg/L and 9.94 mg/L respectively). We can also deduce from this result that the rate of percolation to the underground water corresponds with the concentration of chlorine at the dumpsites.

Natural concentrations of nitrates in groundwater are very low, since plants take up most of the nitrogen near the ground surface before it can reach the water table. However, background levels of nitrates in the leachate and nearby borehole recorded are relatively high (998.60, 4.70 and 21.59, 1.84 mg/l). This might be explained by the fact that contamination might have been brought by the application of fertilizers to nearby farmland. Nitrate does not break down quickly in the soil and does not stick to soil particles. Instead, it travels rapidly with the groundwater and can seep a long way from its source. Nitrate is particular health concerns in the body because it inhibit the distribution of oxygen within the human body by reducing the amount of oxygen that the blood can carry (methemoglobinemia); especially in children as a result of drinking water contaminated with elevated nitrates. (Chapman, 1992).

Sulphates values for the samples of leachate examined are quite variable and may have emanated from oxidation of iron sulphide present in the dump. The maximum value obtained was 267.50 mg/l for sulphate, while the maximum concentration recorded for phosphate was 169.3 mg/l; both from Choba dumpsites. The presence of phosphates in a leachate is dangerous as its presence in water increases eutrophication and also promotes the growth of algae in water bodies. Algal bloom may blanket surface water, used up the available dissolved oxygen and thereby prevent other aquatic organisms from accessing this life-supporting substance. Sulphate and phosphate levels are negligible in the borehole water sampled. Although the concentration of phosphate in the borehole water is low, a minute value of phosphate as low as 0.01mg/l in groundwater promotes the growth of algae (Adekunle *et al.*, 2007). The range of sulphate concentration in borehole samples varied from 0.001 mg/l to 0.05 mg/l. A similar trend was observed in the surface water samples. High concentration of sulphate in water is dangerous as it causes dehydration and diarrhoea in children (Longe and Balogun, 2010).

Anion Concentration in Edible Plant

Table 6: Average Concentration (in mg/kg) of Anion in Edible Plant

Parameters	Pawpaw 1	Potatoes 1	Pawpaw 2	Potatoes 2
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NO ₃ ⁻	1.60	0.95	0.05	0.10
PO ₄ ⁻	1.20	0.80	0.12	0.24
Cl ⁻	< 0.01	< 0.01	< 0.01	< 0.01
SO ₄ ²⁻	0.60	3.12	0.90	1.60

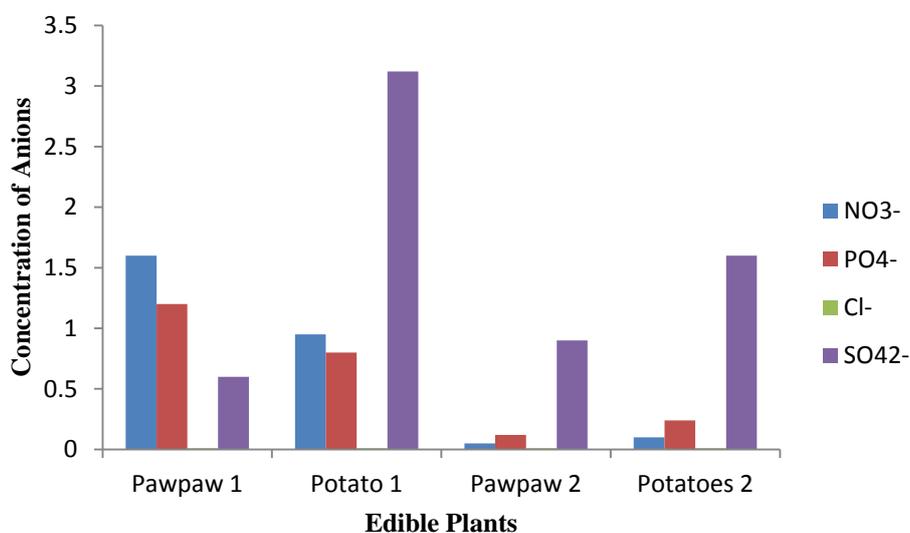


Figure 5: Concentration of Anion (Mg/kg) in Edible Plant

Results obtained in table 6 and figure 5 shows that the concentration of chlorine is negligible/not recorded in all the sampled plants. Choba dumpsite also recorded the highest value of anion – SO₄²⁻ in potatoes with concentration of 3.12 mg/g. All anions were higher in the edible plants than in borehole waters except Cl⁻ but less than concentrations in the soil and leachate respectively. It also confirms that plants seldom absorb Cl⁻ from the soil.

Table 7: Comparison of groundwater quality parameters with International (WHO) Standards and NSDWQ (Nigerian Standard for Drinking Water Quality) (WHO, 1997).

Parameter	L1	L2	W1a	W1b	W2a	W2b	WHO Standard	NSDWQ Standard
Cd	12.60	< 0.01	0.040	< 0.001	< 0.001	< 0.001	0.003	0.003
Pb	19.50	< 0.01	0.20	< 0.001	< 0.001	< 0.001	0.01	0.01
Zn	106.70	0.95	0.90	0.60	0.008	0.006	3.0	3.0
Fe	168.30	94.80	11.30	6.40	2.10	1.60	0.5-50	0.5-50
Cu	94.20	46.30	0.09	0.03	0.21	0.10	1.0	2.0
BOD	11,015.60	170.56	< 0.01	< 0.001	< 0.001	< 0.001	0.8-5	
COD	19,670.10	341.1	< 0.001	< 0.001	< 0.001	< 0.001	< 10	
TDS	9760	168.3	6.60	4.70	15.10	3.40	500	500
pH	6.40	6.20	6.70	6.90	7.40	7.10	6.5-8.5	6.5-8,5
EC	2040.1	69.30	3.60	7.10	2.10	1.60	-	
NO ₃ ⁻	998.60	21.59	4.70	0.80	1.84	3.14	50	50
PO ₄ ⁻	169.30	8.30	0.10	0.07	< 0.01	< 0.01		
Cl ⁻	670.40	392.3	11.30	4.60	9.94	3.98	250	250
SO ₄ ²⁻	267.50	83.60	0.05	< 0.001	0.01	< 0.001	100	300

Table 7 shows that most of the underground water meets the minimum quality of international standard (WHO) and NSDWQ (Nigerian Standard for Drinking Water Quality); though lead was recorded above the minimum drinking water standard in the borehole water near Choba dumpsite; with concentration 0.2 mg/l compared to the minimum standard of 0.01mg/l.

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CONCLUSION

The result of the two dumpsites indicates that the concentrations of contaminants were found to be higher around the dumpsites than the one farther from it. It shows that the contaminations drop with increase in distance from the dumpsites. Though the concentrations of few contaminants are negligible and may not have exceeded drinking water standard.

One of the analyzed borehole water sample obtained near the refuse dump site evidently reflect water quality that is affected by the leachates from the refuse dumpsite. Some contaminants were taken up by the edible plants in the study sample. The result also shows a gradual gradation of concentrations from the leachate, to the soil, to plant, to borehole near the dumpsites and finally the distant borehole water. It shows that the distance of borehole from the source of leachate (dumpsites) has greater impact on the degree and extent of contamination of groundwater. This study reveals that there is an increase in risk to ground water and public health far and near the unengineered dumpsites; although biases and confounding factors cannot be excluded as explanations for this finding. Thus, there is need for the following:

- Distance of dumpsites from human settlement should be maintained.
- Protect, monitor and manage the various dumpsites to minimize public health risk and environmental degradation.
- Establish and enforce effective and efficient solid waste management programme.
- Ensure adherence to regulatory limits, it is better to upgrade the unengineered dumpsite into well engineered sanitary landfill by the stake holders in collaboration with relevant government agencies.

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Concentrations and Seasonal Variation in Heavy Metal Contamination of Leachates, Borehole Water, Soil and Edible Plants near Unengineered Dumpsites in Port Harcourt, Nigeria

¹Eseyin, Olushola Olorunfemi., ²Udom, G. J., ³Osu Charles I.

Institute of Natural Resources, Environment and Sustainable Development, University of Port Harcourt, Rivers State. Nigeria.

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Abstract: There are two major seasons in Nigeria – wet and dry season. This study was carried out to assess concentrations and seasonal variations in heavy metals in leachates, borehole water, soil and edible plants around unengineered dumpsites in Port Harcourt, Nigeria. Samples of leachates, borehole water within 300m from each unengineered dumpsites, soil samples, and two edible plants were collected around each unengineered dumpsites; all for analysis of heavy metal contaminations. The heavy metals studied include Cadmium (Cd), Lead (Pb), Zinc (Zn), Iron (Fe), and Copper (Cu). Analysis of the leachates, borehole waters, soil and edible plants showed that there is high concentration of heavy metals in the environments studied. This may be due to transport from the dumpsite nearby to the leachates, soil, edible plants and borehole waters. Higher concentrations were recorded during wet season than dry season in most of the heavy metals studied. This may be as a result of seasonal rainfall, dilution and run-off during the wet season that flushed the contaminants from the dumpsites into the environment.

Keywords: groundwater, pollution, leachate, unengineered dumpsites, index of geoaccumulation, contamination factor, contamination degree, pollution load index.

INTRODUCTION

The disposal of most wastes in landfills is done after proper waste management processes such as recycling, reuse; sources reduction and treatment operation have been completed in developed countries, (Edward, 2001). However, these practices are not common in developing countries (Cunninghams *et al.*, 2005). This results to the development of unengineered dumpsites of different materials ranging from perishable food wastes to hazardous chemicals which pollute the environment. Landfilling is one of the less expensive methods of disposal of solid waste playing an important role in integrated solid waste management (Peng, 2013). It is reported that about 90% of municipal solid waste (MSW) is disposed in open dumps and landfills in a crude manner creating problems to public health and the environment (Sharholly *et al.*, 2008). Inefficient management of these dumpsites causes uncontrolled gas and liquid emissions. The emitted liquid known as 'Leachate' may contain several organic and inorganic contaminants which have detrimental effects on water, and soil environment (Kolsch and Ziehmman, 2004). Proper treatment and safe disposal of the leachate is one of the major environmental challenges worldwide especially in developing nations (Butt *et al.*, 2014; Mukherjee *et al.*, 2014).

Pastor and Hernández (2012) reported that complex sequence of physical, chemical, and biologically mediated events occurs within a landfill; that leads to degradation and transformation of the refuse. As water percolates through the solid waste, contaminants are leached from the waste. Aziz *et al.* (2010); Eggen *et al.* (2010) and Hennebert *et al.* (2013) outlined the mechanics of contaminant removal to include leaching of inherently soluble materials, leaching of soluble biodegradation products of complex organic molecules, leaching of soluble products of chemical reaction and washout of fines and colloids. The characteristics of leachate produced are highly variable, depending on the composition of the solid waste, precipitation rate, site

hydrology, compaction, cover design, waste age, sampling procedures, and interaction of leachate with the environment as well as landfill design and operation (Nartey *et al.*, 2012).

Municipal landfill leachate is a highly complex effluents which contains dissolved organic matters, inorganic compounds such as ammonium, calcium, magnesium, sodium, potassium, iron, sulphates, chlorides and heavy metals such as cadmium, chromium, copper, lead, zinc, nickel and xenobiotic organic substances (Christensen *et al.*, 2001). This leachate accumulates at the bottom of the landfill and percolates through the soil (Mor *et al.*, 2006).

Many factors influence the leachate composition including the types of wastes deposited in the landfill, composition of wastes, moisture content, the particle size, the degree of compaction, the hydrology of the site, the climate, and age of the landfill and other site specific conditions such as landfill design and type of liner used if any (Rafizul *et al.*, 2011). As a result, surface water, groundwater reservoirs and soil layers become vulnerable to pollution from the dumpsite.

Rapid population growth and development in Nigerian states has resulted in environmental health hazards (Adefemi and Awokunmi, 2009). Wastes are generated from human activities and in most cases not properly managed in most Nigerian cities (Aurangabadkar *et al.*, 2001; Adefemi and Awokunmi, 2009). This leads to low environmental quality which accounts for 25% of all preventable ill health in the world (WHO, 2004). In most cases, wastes are collected and disposed in uncontrolled or unengineered dumpsite sites near residential buildings. These wastes are heaped up and/or burnt, polluting the environment (Akpan, 2004; Uffia *et al.*, 2013). Waste generally leads to proliferation of pathogenic microbes and heavy metals which can transfer significantly to the environment (Adefehinti, 2001). Leachates from dumpsites constitute a source of heavy metal pollution to both soil and aquatic environments (Ali and Abdel-Satar, 2005). This may have serious effects on soils, crop and human health (Bahnasawy *et al.*, 2011). Water contaminants have been mainly biological and chemical in origin (Uffia *et al.*, 2013). The quality of underground water could be compromised if it is not distant from constant source of pollution. The quality of underground water is compromised by the indiscriminate dumping of waste in the environment and contamination by leachate. (David and Oluyeye 2014).

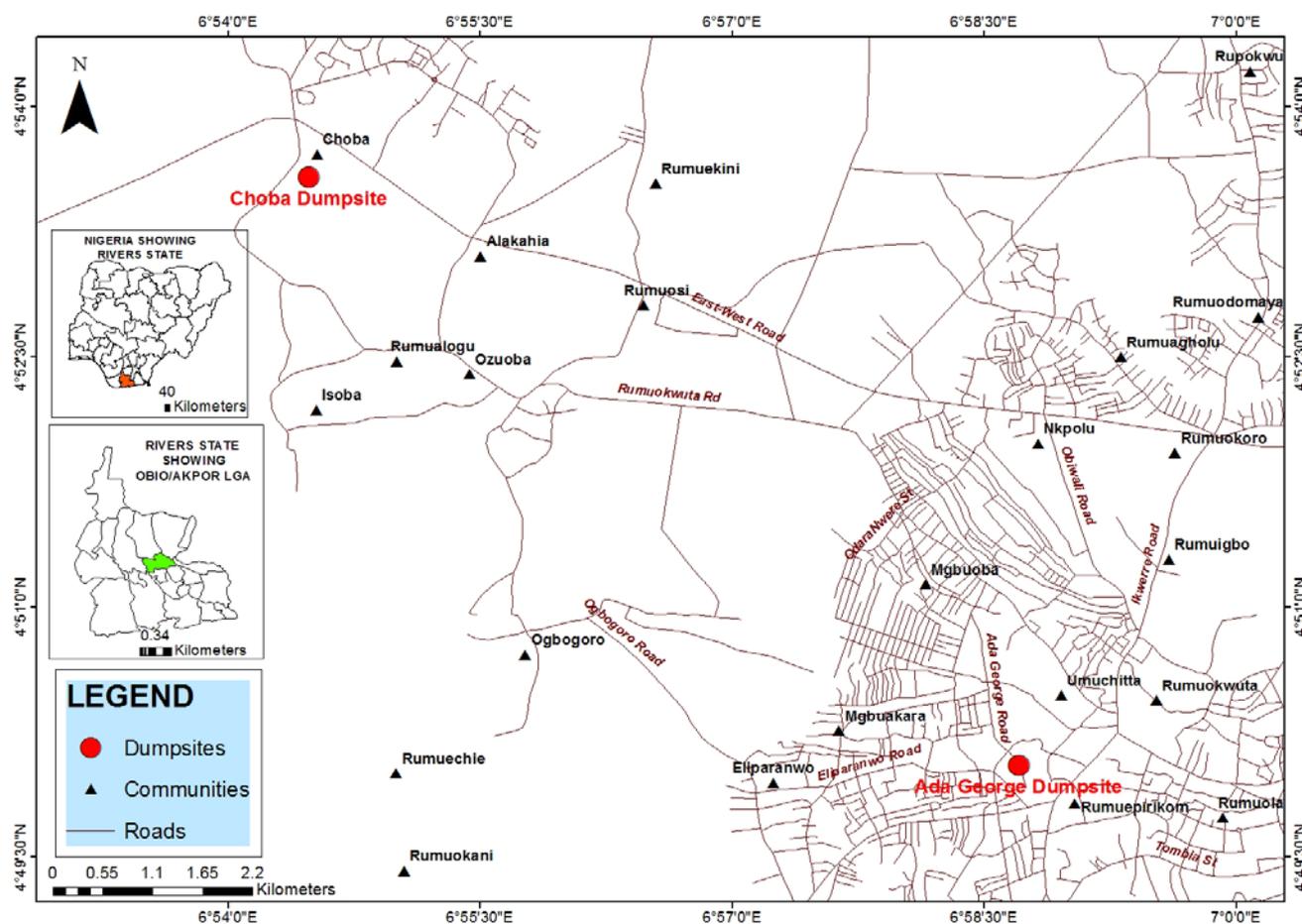
Generally, the practices in the unengineered dumpsites at Port Harcourt is unrestricted to different sources of wastes; which ends up in unengineered dumpsites. Dumpers do have access to the site at any time of the day. Scavengers have free access to the dump, and they scatter the waste to recover valuable material. Like many cities in Nigeria, Port Harcourt is faced with the problems of improper collection, handling and disposal of domestic wastes. Improper waste disposal system contributes immensely to the contaminations of groundwater with heavy metals which are not commonly found in groundwater, their presence is largely as a result of environmental contamination (Bahnasawy *et al.*, 2011).

Heavy metals can be found in dumpsite leachate, air and soil produced either from plastic burning or smelting of scrap metals and e-waste. Trace metal uptake by plants is generally limited and usually shows saturation characteristics. However, phytotoxicity thresholds (lowest concentration at which decreased plant growth occurs) are generally higher than tissue toxicity thresholds for those animals consuming them. Many plants demonstrate tolerance to those metals they absorb, and cultivars with extreme tolerance are now available in commercial quantities for use in reclamation or decontamination work. Some species hyper-accumulate trace metals, making them problematic food sources, but giving them potential value as indicator species for monitoring programmes or as bioaccumulators during phytoremediation programmes (Treshow 1984, Markert 1993, Farago 1994, Ross and Kaye 1994, Saxe 1996, Brooks 1998). Material harvested from such species used in remediation work will need either to be incinerated or to go to secure landfill.

MATERIALS AND METHODS

Study Area

Cross-sectional study of selected unengineered refuse dumpsite was conducted in Port Harcourt, Rivers State, Nigeria; from July, 2017 to May, 2018 to assess the concentrations and seasonal variation in heavy metal contamination of leachates, borehole water, soil and edible plants near unengineered dumpsites of Port Harcourt, Nigeria, in both dry and wet seasons. Port Harcourt is the capital and largest city in Rivers State, Nigeria. It is located in the Niger-Delta region; and at the southernmost part of Nigeria between longitude 7° 00' and 7° 15' East of the Greenwich meridian and Latitude of 4° 30' and 4° 47' North of the equator. The average temperature throughout the year in the city is relatively constant, showing little variation throughout the year. Its average temperature is between 25°C – 28°C.



Samples of soil, edible plants (Pawpaw and Potatoes), leachates and borehole water were collected around two unengineered dumpsites in Port Harcourt, Rivers State Nigeria for laboratory analysis during dry and wet seasons. The borehole waters were collected from privately owned borehole. Samples were immediately transferred to the laboratory and stored in refrigerator at 4°C. The sampling points were selected based on the availability of borehole around the unengineered dumpsites. Geomorphological study of the region indicates that most of the area where the unengineered dumpsites were located was found to have deep pediments, with shallow and buried pediments in other parts.

Analytical Procedure

The samples were analysed for heavy metals. The results obtained were compared and with standards from organisations and bodies. Five quality tools/indices were applied in this study for wider interpretations of data. These are:

1. Contamination Factor (CF)
2. Contamination Degree (CD)
3. Pollution Load Index (PLI)
4. Index of Geoaccumulation (Igeo)
5. Bioaccumulation Factor (BAF)

Contamination Factor (CF)

Contamination factor is used to determine the concentration status of the sediment in the present study. Contamination factor was calculated by comparing the mean of trace metal concentration with average shale or background concentration given by Turekian and Wedepohl (1961), which is used as global standard reference for unpolluted sediment. The CF is the single element index. CF for each metal was determined according to Thomilson, *et al.* (1980) by the following equation:

$$\text{Contamination Factor (CF)} = \frac{\text{Mean Metal Concentration at Contaminated Site}}{\text{Metal Average Shale Concentration}}$$

Hakanson (1980) classified CF values into four grades, i.e,

- a) $CF < 1$ = low CF,
- b) $1 \leq CF < 3$ = moderate CF,
- c) $3 \leq CF < 6$ = considerable CF and
- d) $CF > 6$ = very high CF.

Contamination Degree (CD)

Contamination degree is used to determine the degree of overall contamination or concentration status in the sampling site. CD is the sum of all CF values of a particular sampling site (Aksu *et al.*, 1998 and Hakanson, 1980).

$$CD = \sum_{i=1}^{i=n} (CF)$$

Where n is the number of analysed elements and CF is the contamination factor.

Ahdy and Khaled (2009) classified CD in terms of four grade ratings of sediments, i.e.

- $CD < 6$ shows low CD,
- $6 \leq CD < 12$ shows moderate CD,
- $12 \leq CD < 24$ shows considerable CD and
- $CD \geq 24$ shows very high CD.

Pollution Load Index (PLI)

Pollution severity and its variation were determined with the use of pollution load index. Pollution load index for each site was determined by the method proposed by Thomilson *et al.* (1980). It is used for detecting pollution which permits a comparison of pollution levels between sites and at different times. The PLI was obtained as a concentration factor of each heavy metal with respect to the background value in the soil. The PLI for a single site is the nth root of n number multiplying the factors (CF values) together. PLI for each site was determined by the following equation:

$$PLI = (n\sqrt{CF_1 \times CF_2 \times CF_3 \times \dots \times CF_n})$$

Where

CF is the contamination factor and

n is the number of parameters.

Table 1: Categories of the sediment quality according to PLI

Pollution Load Index	Categories
$PLI < 1$	Perfection
$PLI = 1$	indicate only baseline levels of pollutants present and
$PLI > 1$	indicate progressive deterioration of sites

(After Mohiuddin *et al.* (2010))

Index of Geoaccumulation (Igeo)

A common approach to estimating the enrichment of metal concentrations above background or baseline concentrations is to calculate the index of geoaccumulation (Igeo) as proposed by Müller, 1969; Abraham and Parker, 2008). Igeo is used to quantify the extent of heavy metal contamination associated with soils. This index is basically a single metal approach to quantify metal pollution in sediments when the concentration of toxic heavy metal is 1.5 or more times greater than their lithogenic background values (Gaur *et al.*, 2005). Geo-accumulation index is calculated using the following equation:

$$I_{geo} = \log_2 \frac{C_n}{1.5B_n}$$

Where

C_n is the measured concentration of the element n in the soil tested,

B_n is the geochemical background value of the element n in average crust (average shale concentration has been given by Turekian and Wedepohl 1961; Taylor and McLennan 1985; and Wedepohl 1995).

1.5 is the factor used to compensate possible variations in background data (correction factor), which may be attributed to lithogenic effect (Taylor, 1972).

A geochemical background value of Fe was taken from Turekian and Wedepohl (1961). The others were taken from (Reimann *et al.*, 2005; Aksu *et al.* 1998) as: Cu: 17 ppm, Zn: 65 ppm, Pb: 8.5 ppm Cd: 0.003 ppm

The Igeo factor is not comparable to other indices of metal enrichment due to the nature of the Igeo calculation; it involves a log function and a background multiplication of 1.5. It is composed of seven grades (0–6) indicating various degrees of metal enrichment above the average shale value ranging from unpolluted to very high polluted sediment quality. Table 2.

Table 2: Classification of Sediment Grade based on Igeo Index (after Muller, 1969).

Igeo value	Class	Category
$I_{geo} \leq 0$	0	Unpolluted
$0 < I_{geo} \leq 1$	1	From unpolluted to moderately polluted
$1 < I_{geo} \leq 2$	2	Moderately polluted
$2 < I_{geo} \leq 3$	3	From moderately to strongly polluted
$3 < I_{geo} \leq 4$	4	strongly polluted
$4 < I_{geo} \leq 5$	5	From strongly to extremely polluted
$I_{geo} > 5$	6	extremely polluted

Bioaccumulation Factor (BAF)

BAF was calculated by:

$$BAF = \frac{C_{plant}}{C_{soil}}$$

C_{plant} and C_{soil} are metals concentration in the plant shoot (mg/kg) and soil (mg/kg), respectively. Ma *et al.*, 2001; and Cluis, 2004 categorized BAF further as

Excluder = BAF < 1

Effective Accumulator = BAF = 1

Hyperaccumulators = BAF > 1

RESULTS AND DISCUSSION

Table 3: Average Result of Sampling during Dry Season

Parameter	L1	L2	W1	W2	S1	S2	Paw 1	Paw 2	Pot 1	Pot 2
Cd	12.60	< 0.01	0.040	< 0.001	9.50	< 0.01	0.94	< 0.01	0.60	< 0.01
Pb	19.50	< 0.01	0.20	< 0.001	16.40	< 0.01	1.60	< 0.01	2.30	< 0.01
Zn	106.70	0.95	0.90	0.008	76.30	22.14	6.40	18.11	11.60	9.30
Fe	168.30	94.80	11.30	2.10	146.70	89.60	16.30	6.10	3.40	1.30
Cu	94.20	46.30	0.09	0.21	63.40	40.10	3.14	1.30	4.50	0.50

Where: **L1** – Leachate at Choba dumpsite, **L2** = Leachate at Ada-George dumpsite, **W1** = Borehole water near Choba dumpsite, **W2** = Borehole water near Ada-George dumpsite, **S1** = Soil sample from Choba dumpsite, **S2** = Soil sample from Ada-George dumpsite, **Paw 1** = Pawpaw plant from Choba dumpsite, **Paw 2** = Pawpaw plant from Ada-George dumpsite, **Pot 1** = Potato plant from Choba dumpsite, **Pot 2** = Potato plant from Ada-George dumpsite

Table 4: Average Result for Sampling during Wet Season

Parameter	L1	L2	W1	W2	S1	S2	Paw 1	Paw 2	Pot 1	Pot 2
Cd	19.30	0.30	0.13	<0.001	14.60	1.80	1.08	<0.001	1.00	<0.001
Pb	28.30	0.09	0.60	0.003	21.30	0.90	2.10	<0.001	2.90	<0.001
Zn	143.50	43.40	1.30	0.06	94.70	24.30	8.10	21.20	13.70	10.50
Fe	193.60	154.70	14.80	4.30	154.20	103.30	18.70	6.90	4.00	1.60
Cu	113.40	64.70	0.14	0.60	66.60	43.30	4.30	1.90	5.60	0.80

Where: **L1** – Leachate at Choba dumpsite, **L2** = Leachate at Ada-George dumpsite, **W1** = Borehole water near Choba dumpsite, **W2** = Borehole water near Ada-George dumpsite, **S1** = Soil sample from Choba dumpsite, **S2** = Soil sample from Ada-George dumpsite, **Paw 1** = Pawpaw plant from Choba dumpsite, **Paw 2** = Pawpaw plant from Ada-George dumpsite, **Pot 1** = Potato plant from Choba dumpsite, **Pot 2** = Potato plant from Ada-George dumpsite

Table 5: Concentrations of Metals in Leachate and Borehole Water during Dry Season

	Cd	Pb	Zn	Fe	Cu
L1	12.6	19.5	106.7	168.3	94.2
L2	0.01	0.01	0.95	94.8	46.3
W1	0.04	0.2	0.9	11.3	0.09
W2	0.001	0.001	0.008	2.1	0.21

Table 6: Concentrations of Metals in Leachate and Borehole Water during Wet Season

	Cd	Pb	Zn	Fe	Cu
L1	19.3	28.3	143.5	193.6	113.4
L2	0.3	0.09	43.4	154.7	64.7
W1	0.13	0.6	1.3	14.8	0.14
W2	0.001	0.003	0.06	4.3	0.6

High concentration of metal prevailed in the leachate. Based on the data collected from this study as shown in table 5, Cd (0.04) and Pb (0.2) were recorded during the dry season at the borehole water in Choba dumpsite (W1). During wet season, the values increase to 0.13 and 0.60 respectively for Cd and Pb. Cd and Pb were not detected in other borehole samples. Fe has the highest recorded; and insignificant traces of Cd and Pb appears at the Ada-George dumpsites. This shows that there is likely a downward movement of metals from the leachate to meet with the groundwater aquifer or borehole water. From this study, significant quantity of Cd, Pb, and Fe were recorded during dry and wet season at Choba dumpsite.

Cadmium is widely distributed in the earth’s crust. Human activities (such as mining, metal production, and combustion of fossil fuels) can result in elevated cadmium concentrations in the environment. Based on the data in table 5, L1 and the borehole at Choba dumpsite (W1) sampled during dry season with Cd 12.6 and 0.04mg/L respectively did not meet NSDWQ (2007), WHO (2011) standard as they exceeds the maximum limit of 0.01 and 0.003 respectively (Table 11).. Other values recorded during dry season are within limits of 0.01 and 0.003.

During wet season, there is a general increase in the concentration of Cd. L1, L2, and W1 for the water parameters with 19.30, 0.3, 0.13 respectively did not meet NSDWQ (2007), WHO (2011) standard. W2 with <0.001 is within NSDWQ (2007), WHO (2011) standard.

Lead detected in samples originates from used batteries and other lead bearing wastes in the dumpsite. L1 (19.50) and W1 (0.20 mg/L) recorded high during dry season (table 5); which do not meet the standard set by NSDWQ (2007), WHO (2011). During wet season (table 6), except the borehole water at Ada-George (W2), all other water samples (L1=28.3, L2=0.09, W1=0.60) has exceeded the maximum value set by WHO and NSDWQ. The result shows general increase in the value of Pb during wet season compared to dry season. This may be linked to washing of metals from the dumpsites to those water bodies.

Zinc is a transition metal that occurs naturally in soil about 70mg/kg in crystal rock. It is a very important material used in the production of batteries, rubber, paints, cosmetics, chemicals, pharmaceuticals, and a protective coating for iron and steel. It is also used as a micronutrient in agricultural fertilizers. Traces of Zn were recorded in some of the sampled parameters. Except L1 in

dry season (106.7) and L1 (143.5) and L2 (43.40) in wet season, values of Zn in the sampled water parameters show that they are within the acceptable limits of NSDWQ and WHO (Table 11).

Iron is a common occurring metallic element. The value of Fe recorded during dry and wet season at both dumpsites as recorded in Table 5 and table 6 exceeds the maximum limit set by WHO and NSDWQ.

Cu was also recorded in the two borehole waters during dry and wet season (Table 5 and table 6), but they are all below maximum limit or standard set by WHO and NSDWQ.

Generally, Fe has the highest recorded concentration of the metals in W1 during the wet season with 14.80 mg/L; which indicates that all the dumpsites receives high wastes from iron and steel scrap. Presence of Cd, Pb, and Zn indicate that batteries, fluorescent lamps, petroleum compounds have contaminated the dumpsites.

The different metals detected are indications that the Port Harcourt unengineered dumpsites receive variety of wastes from different waste streams. This is due to the fact that wastes from industrial, commercial and household items are deposited there without any form of segregation.

Table 7: Concentration of Metals in the Soil and Edible Plants during Dry Season

	Cd	Pb	Zn	Fe	Cu
S1	9.5	16.4	76.3	146.7	63.4
S2	0.01	0.01	22.14	89.6	40.1
Paw 1	0.94	1.6	6.4	16.3	3.14
Paw 2	0.01	0.01	18.11	6.1	1.3
Pot 1	0.6	2.3	11.6	3.4	4.5
Pot 2	0.01	0.01	9.3	1.3	0.5

Table 8: Concentration of Metals in the Soil and Edible Plants during Wet Season

	Cd	Pb	Zn	Fe	Cu
S1	14.6	21.3	94.7	154.2	66.6
S2	1.8	0.9	24.3	103.3	43.3
Paw 1	1.08	2.1	8.1	18.7	4.3
Paw 2	0.001	0.001	21.2	6.9	1.9
Pot 1	1	2.9	13.7	4	5.6
Pot 2	0.001	0.001	10.5	1.6	0.8

Although, soil is not directly consumed by human being, studies of contaminants in them linked with other pathways are indications of possible transfer or movements of contaminants from one medium to the other. Concentrations of metals obtained from the two dumpsites during dry season include S1 (Cd=9.50, Pb=16.40, Zn=76.30, Fe=146.70, Cu=63.40), and S2 (Cd=<0.001, Pb=<0.001, Zn=22.14, Fe=89.60, Cu=40.10). From table 7, Fe in the soil sample has the highest concentration (146.70 mg/kg to 154.20 mg/kg), followed by Zn, Cu, Pb, and Cd in that order. Higher metals were recorded in S1 than S2; S2 having little or negligible concentrations during the dry season. Concentrations of metals obtained from the two dumpsites during wet season include S1 (Cd=14.60, Pb=21.30, Zn=94.70, Fe=154.20, Cu=66.60), and S2 (Cd=1.80, Pb=0.9, Zn=24.30, Fe=103.30, Cu=43.30). This shows a remarkable increase in the values from dry season to wet season. This result correlates with the values in leachate where Fe has the highest concentration, and that soil at Choba dumpsite (S1) receives more metallic waste than Ada-George dumpsite (S2). Cd and Pb are lower in the soil samples than other metals which indicate that there are fewer dumping of batteries, fluorescent lamps, photographic materials and petroleum compounds than other metallic sources.

Tables 7 and 8 shows that all the plants have taken up metal. Zn and Fe are the most absorbed metals with 21.20 mg/kg and 18.70 mg/kg respectively. Edible plants at Ada-George dumpsite was free of Cd and Pb, while edible plants at Choba dumpsites was recorded to have absorbed all the forms of metal analysed. This can be linked to the fact that Ada-George dumpsite is relatively free of any source of Cd and Pb like batteries, radiographic materials etc. There is also an increase in concentration of all the metals during the wet season both in the soil and in the edible plants. This shows that water helps in the transfer of metals from the soil to edible plants. Chlorine was negligible in the edible plants sampled, but traces of other metals were found in them.

Table 9: Effects of Season on Concentration of Heavy Metals in Leachates and Borehole Water

Parameter	L1		L2		W1		W2	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
	Cd	12.60	19.30	< 0.01	0.30	0.040	0.13	<0.001
Pb	19.50	28.30	<0.01	0.09	0.20	0.60	<0.001	0.003
Zn	106.70	143.50	0.95	43.40	0.90	1.30	0.008	0.06
Fe	168.30	193.60	94.80	154.70	11.30	14.80	2.10	4.30
Cu	94.20	113.40	46.30	64.70	0.09	0.14	0.21	0.60

Table 10: Effects of Season on Concentration of Heavy Metals in the Soil and Edible Plants

Parameter	S1		S2		Paw 1		Paw 2		Pot 1		Pot 2	
	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
	Cd	9.50	14.60	<0.01	1.80	0.94	1.08	<0.01	<0.001	0.60	1.00	<0.01
Pb	16.40	21.30	<0.01	0.90	1.60	2.10	<0.01	<0.001	2.30	2.90	<0.01	<0.001
Zn	76.30	94.70	22.14	24.30	6.40	8.10	18.11	21.20	11.60	13.70	9.30	10.50
Fe	146.70	154.20	89.60	103.30	16.30	18.70	6.10	6.90	3.40	4.00	1.30	1.60
Cu	63.40	66.60	40.10	43.30	3.14	4.30	1.30	1.90	4.50	5.60	0.50	0.80

The result in table 9 and 10 shows that season season has great influence on the rate of contaminant of heavy metals in leachates, borehole water, soil and edible plants. From the table, the boxes coloured green has higher contaminant level than the boxes coloured white. The boxes coloured orange is used to indicate those heavy metals studied that has the same value or no significant change in concentrations during dry and wet season.

In both L1 and L2, all heavy metals sampled shows increase in the rate of contamination from dry season to wet season. This may be as a result of dissolution of solutes of heavy metals from the dumpsites during the wet season, flushed into the leachates by the activities of rain, and dilute the leachates. In the borehole water samples, most of the heavy metals have increased in values during wet season than dry season. Overall result of leachate and borehole water samples shows that most heavy metals increased from dry season to wet season, which indicate that rain water is an important medium of transport of heavy metals from the dumpsites to the leachate and eventually borehole water.

Andrews (1972) reported that heavy rain may improve the water quality by diluting and washing away pollutants, and may also lower the water quality by flushing in pollutants such as fertilizers and suspended or dissolved solids. We can therefore conclude that season has significant effect on the concentrations of heavy metals in the leachates, borehole water, soil and edible plants; as rainwater helps to dissolve the solute for onward movement to the leachate, soil, borehole water and edible plants.

Table 11: Comparison of Groundwater Quality Parameters with International Standards WHO (World Health Organisation) and NSDWQ (Nigerian Standard for Drinking Water Quality)

Parameter	L1	L2	W1	W2	WHO Standard	NSDWQ Standard
Cd	12.60	< 0.01	0.040	< 0.001	0.01	0.003
Pb	19.50	< 0.01	0.20	< 0.001	0.05	0.01
Zn	106.70	0.95	0.90	0.008	5.0	3.0
Fe	168.30	94.80	11.30	2.10	0.3	0.3
Cu	94.20	46.30	0.09	0.21	1.0	2.0
TDS	9760	168.3	6.60	15.10	500	500
pH	6.40	6.20	6.70	7.40	6.5-8,5	6.5-8,5
EC	2040.1	69.30	3.60	2.10	300	1000
NO ₃ ⁻	998.60	21.59	4.70	1.84	50	50
PO ₄ ⁻	169.30	8.30	0.10	< 0.01		
Cl ⁻	670.40	392.3	11.30	9.94	250	250
SO ₄ ²⁻	267.50	83.60	0.05	0.01	200	100

*All values in mg/L, except pH and EC ($\mu\text{S/cm}$); NSDWQ (2007), WHO (2011).

Data Analysis

Table 12: CF, CD, PLI, Igeo for Borehole water at Choba Dumpsite

Parameter n = 5	W1 - dry				W1 - wet				
	Field Data	Conc. (Bn)	CF	I _{geo}	Field Data	Conc. (Bn)	CF	I _{geo}	
Cd	0.040	0.003	13.33	3.15	0.13	0.003	43.33	4.85	
Pb	0.20	8.5	0.02	-5.64	0.60	8.5	0.07	-4.32	
Zn	0.90	65.0	0.01	-6.64	1.30	65.0	0.02	-6.64	
Fe	11.30	5.0	2.26	1.51	14.80	5.0	2.96	0.98	
Cu	0.09	17.0	0.01	~	0.14	17.0	0.01	-6.64	
			CD	15.63				CDegree	46.39
			PLI	0.00				PLI	0.29

Table 13: CF, CD, PLI, Igeo for borehole water at Ada-George Dumpsite

Parameter n = 5	W2 - dry				W2 - wet				
	Field Data	Conc. (Bn)	CF	I _{geo}	Field Data	Conc. (Bn)	CF	I _{geo}	
Cd	< 0.001	0.003	0.33	-2.18	< 0.001	0.003	0.33	-2.18	
Pb	< 0.001	8.5	0.00	-3.64	0.003	8.5	0.00	~	
Zn	0.008	65.0	0.00	~	0.06	65.0	0.00	~	
Fe	2.10	5.0	0.42	-1.84	4.30	5.0	0.86	-0.81	
Cu	0.21	17.0	0.01	-6.64	0.60	17.0	0.04	-5.64	
			CD	0.76				CD	1.23
			PLI	0.00				PLI	0.00

Table 14: Comparing Bioaccumulation Factors of Pawpaw at Choba dumpsites

Parameter	S1-dry	Paw 1	BAF	S1-wet	Paw 1	BAF
Cd	9.50	0.94	0.10	14.60	1.08	0.07
Pb	16.40	1.60	0.10	21.30	2.10	0.10
Zn	76.30	6.40	0.08	94.70	8.10	0.09
Fe	146.70	16.30	0.11	154.20	18.70	0.12
Cu	63.40	3.14	0.05	66.60	4.30	0.06

Table 15: Comparing Bioaccumulation Factors of Potato at Choba dumpsites

Parameter	S1-dry	Pot 1	BAF	S1-wet	Pot 1	BAF
Cd	9.50	0.60	0.06	14.60	1.00	0.07
Pb	16.40	2.30	0.14	21.30	2.90	0.14
Zn	76.30	11.60	0.15	94.70	13.70	0.14
Fe	146.70	3.40	0.02	154.20	4.00	0.03
Cu	63.40	4.50	0.07	66.60	5.60	0.08

Table 16: Comparing Bioaccumulation Factors of Pawpaw at Ada-George dumpsites

Parameter	S2-dry	Paw 2	BAF	S2-wet	Paw 2	BAF
Cd	<0.01	<0.01	-	1.80	<0.001	0.00
Pb	<0.01	<0.01	-	0.90	<0.001	0.00
Zn	22.14	18.11	0.82	24.30	21.20	0.87
Fe	89.60	6.10	0.07	103.30	6.90	0.07
Cu	40.10	1.30	0.03	43.30	1.90	0.04

Table 17: Comparing Bioaccumulation Factors of Potato at Ada-George dumpsites

Parameter	S2-dry	Pot 2	BAF	S2-wet	Pot 2	BAF
Cd	<0.01	<0.01	-	1.80	<0.001	0.00
Pb	<0.01	<0.01	-	0.90	<0.001	0.00
Zn	22.14	9.30	0.42	24.30	10.50	0.43
Fe	89.60	1.30	0.01	103.30	1.60	0.02
Cu	40.10	0.50	0.01	43.30	0.80	0.02

Table 18: Comparing CF, CD, PLI, Igeo for Soil at Choba dumpsites

Parameter n = 5	S1-dry				S1-wet			
	Field Data	Conc. (Bn)	CF	I _{geo}	Field Data	Conc. (Bn)	CF	I _{geo}
Cd	9.50	0.003	3166.67	11.04	14.60	0.003	4,866.67	11.66
Pb	16.40	8.5	1.93	0.37	21.30	8.5	2.51	0.74
Zn	76.30	65.0	1.17	-0.36	94.70	65.0	1.46	-0.04
Fe	146.70	5.0	29.34	4.29	154.20	5.0	30.84	4.36
Cu	63.40	17.0	3.73	1.32	66.60	17.0	3.92	1.38
		CD	3202.84			CD	4,905.4	
		PLI	3.79			PLI	4.64	

Table 19: Comparing CF, CD, PLI, Igeo for Soil at Ada-George dumpsites

Parameter n = 5	S2-dry				S2-wet			
	Field Data	Conc. (Bn)	CF	I _{geo}	Field Data	Conc. (Bn)	CF	I _{geo}
Cd	< 0.001	0.003	0.33	1.15	1.80	0.003	600.00	8.64
Pb	< 0.001	8.5	0.00	-	0.90	8.5	0.11	-3.84
Zn	22.14	65.0	0.34	-2.12	24.30	65.0	0.37	-2.00
Fe	89.60	5.0	17.92	3.58	103.30	5.0	20.66	3.78
Cu	40.10	17.0	2.36	0.65	43.30	17.0	2.55	0.77
		CD	20.95			CD	623.69	
		PLI	0.00			PLI	4.19	

If the average concentration of metal in the soil is higher than the average shale concentration, it indicates that there is an apparent metal pollution risk for the sampled soil. Excess of the shale concentrations shows that the excess comes mainly from the dumpsites. Tables 12 and 13 shows that there is increase in the concentration of most metals in the wet season than in the dry season as evidenced in the CF values obtained. Cd at W1 (43.33 against the dry season value of 13.33), Fe in W1 with 2.96 against the dry season value of 2.26). Though, other metals in the borehole are still low in CF, Cd has now increased in W1 to 43.3 (very high CF), Fe in W1 has increased to 2.96 (approaching a considerable CF).

During dry season in S1, Zn has the lowest CF with 1.17, and the highest was recorded in Cd with 3,166.67. Others are Fe (29.34), Cu (3.73), and Pb (1.93). This shows that the soil in S1 is from moderately polluted to very highly polluted. Low CF was recorded in Cd (0.03), Pb (0.00), and Zn (0.34). Cu recorded 2.36 (which is a moderate CF), and Fe 17.92 (very high CF). CF for Cd and Fe are very high in the two dumpsites. This shows that there is increase in the quantity of batteries and metallic products dumped into the unengineered dumpsites.

During wet season, the same order was repeated in S1 as the dry season with Zn having the lowest CF during wet season with 1.46; and the highest was recorded in Cd with 4,866.67. Others in descending order are Fe (30.84), Cu (3.92) and Pb (2.51). This shows that the soil in S2 is from moderately polluted to very highly polluted (i.e low CF to high CF). S2 however has lower CF in Pb and Zn with 0.11 and 0.37 respectively. Others in ascending order are Cu (2.55 – moderate CF), Fe (20.66 – very high CF) and Cd (600.00 – very high CF). CF for Cd and Fe are very high in the two dumpsites as recorded during dry season. This shows that there is increase in the quantity of batteries and metallic products dumped into the unengineered dumpsites. S1 also recorded relatively higher CF than S2. The same trend of increase in metal concentration was recorded in both Choba and Ada-George dumpsite from dry season to wet season.

Index of geoaccumulation (Igeo)

Igeo test conducted to estimate the enrichment of metal concentrations above background or baseline concentrations shows that Cd and Fe are the principal metals observed to have polluted the two borehole waters (Tables 12 and 13). It cleared Ada-George dumpsites of any additional contaminant apart from the one from the earth crust. But Cd and Fe were observed to have strongly and moderately polluted the water respectively in W1. Cd was (3.15, 4.85 for dry and wet season respectively) and Fe (1.51 and 0.98 for dry and wet season respectively). This indicates progressive deterioration of sites and moderately polluted sites respectively. It also conforms to the results from CF and CD. The result from the Ada-George borehole (W2) shows more perfection as all the CF records were low, all CD shows low result, there is perfection in PLI, and the Igeo indicated that the borehole waters were not polluted. The result obtained in tables 18 and 19 suggests that these metals may have originated from anthropogenic sources and not from natural processes or crustal materials alone. Igeo result for S1 includes Cd (11.04), Pb (0.37), Zn (-0.36), Fe (4.29), Cu (1.32); and S2 includes Cd (1.15), Pb (-), Zn (-2.12), Fe (3.58), Cu (0.65). The result shows that the most polluted metal in S1 is Cd (extremely polluted), and the least polluted metal is Zn (which indicates unpolluted). S2 has contrasting order with the highest being Fe (3.38, indicating strongly polluted), followed by Cd (1.15), Cu (0.65), Zn and Pb (with -2.12 and infinity falling in the range of unpolluted).

During wet season, the result shows that Zn still remain the only metal that did not enrich the soil with values less than 0 (S1 = -0.04, and S2 = -2.00) in the wet season. However, S2 recorded a Pb value less than 0 (-3.84) during the wet season. Other results range from unpolluted to moderately polluted, and to extremely polluted. S1 = Cd (11.66), Pb (0.74), Zn (-0.004), Fe (4.36) and Cu (1.38). S2 = Cd (8.64), Pb (-3.84), Zn (-2.00), Fe (3.78) and Cu (0.77).

Generally, Index of Geoaccumulation shows that Zn and Pb show no pollution i.e. the soil is not polluted of Zn and Pb. However, moderate pollution was recorded for Choba dumpsites during the dry and wet season. There is gradation from strongly polluted with Fe to extremely polluted with Cd in both dumpsites. This implies that urgent attention has to be given to the dumpsites to avoid or prevent further degradation of the soil.

Contamination Degree (CD)

CD analysis result shows that only W1 (borehole near Choba dumpsite) shows from considerable CD (15.63) to very high CD (46.39) during dry and wet seasons respectively. This indicates that to a very large extent, the highest polluted borehole water is the Choba dumpsite (W1). There is also a significant increase in CD from dry to wet season. It increased in W1 from 15.63 to 46.39 and in W2 from 1.62 to 2.02. The two dumpsites shows considerable CD during dry season (S1 = 20.95) to very high CD (S2 = 3,202.84). This shows that the degree of pollution or contamination of metals on the soil is very high.

CD values in the soil however increases seriously during the wet season (S1 = 4,905.4), (S2 = 623.69). This may be unconnected with the washing of contaminants from the dumpsites into the soil as a result of rain or erosion. It shows that both sites have very high degree of contamination.

Pollution Load Index (PLI)

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Pollution load index to determine the severity and variation of pollution shows perfection in all the water samples analysed as 0 was recorded. Pollution Load Index that recorded 0 in the borehole water during dry season now has 0.29 in W1. This still shows perfection in W1, but a gradual build-up of metals in W1.

PLI in S1 (3.79) during dry season shows that there is progressive deterioration of site as the value is greater than 1. However, S2 (0.00) during dry season shows perfection. It is therefore possible that Ada-George dumpsite is a relatively older dumpsite with lower metabolic reactions than in Choba dumpsite that prompted perfection in metal contamination. This demonstrates the fact that S1 is more polluted than S2. During wet season, Pollution Load Index of **4.64** was recorded in S1 and S2 has **4.19** for PLI, which shows that there is progressive deterioration of the two sites during wet season.

Bioaccumulation Factor (BAF)

Bioaccumulation factor value recorded during the two seasons and at all the borehole waters are less than 1 (Tables 14 to 17). This shows that all are excluders, and that there is no transfer of heavy metals from the soil into the plants.

CONCLUSION

From the general analysis, some concentrations did not meet the standards of WHO and NSDWQ, while others met the standard. Most of the indices revealed that the study area was seriously affected by different heavy metals. Wet season recorded higher values of the overall indices than dry season. These metals with high concentrations in the studied soils may have been mixed with groundwater by leaching. Most of the leachates and borehole water at the unengineered dumpsites are of poor quality since contaminated by the leachate. The edible plants have also absorbed some traces of heavy metals which can bioaccumulate or biomagnify to create health and environmental effects.

From this study we can conclude that there are high concentrations of heavy metals reported near the unengineered dumpsites studied. The study also revealed that more contaminants were recorded during wet season than dry season.

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Haptoglobin Revisited

K. J. Joshi*, B. T. Shah and Dr. (Mrs.) V. R. Rathod****

Directorate of Forensic Science Laboratory, Kalina, Mumbai.

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Abstract- Haptoglobin (abbreviated as Hp) is a protein in the blood plasma that binds free hemoglobin released from erythrocytes with high affinity and thereby inhibits its oxidative activity. Three phenotypes of Hp found in humans: Hp 1-1, Hp 2-1, and Hp 2-2. The Haptoglobin groups can be used in the cases of disputed paternity in forensic science. As we know in science and also in forensic science the collection of reliable data is very important. If large data is available, any conclusion based on this data is reliable and undisputable. Different population studies had carried out all over the world to study the gene frequency of these three haptoglobin phenotypes. This study is an effort in this direction as to study the changes in the percentage of different Haptoglobin types and to compare it with the previously available data.

Index Terms- Electrophoresis, Genotype, Gene frequency, Haptoglobin, PAGE, Phenotype, Population Study

I. INTRODUCTION

Haptoglobin is produced mostly by hepatocytes but also by other tissues: e.g. skin, lung, and kidney. The Hp protein is composed of two pairs of 'a' chain and 'b' chain, and the polymorphism of the protein reflects inherited variations in the Hp a-chain polypeptides. The a chain of the Hp2 protein is composed of 142 amino acid residues and is a product of a partial gene duplication of the Hp1 a chain, which has 83 amino acid residues. The molecular weight of Hp varies depending on the type. It is between 90,000 and 100,000 daltons in case of type Hp1-1 and has a sedimentation coefficient of 4.4s. Hp2-2 has a molecular weight of around 400,000 daltons and has a sedimentation coefficient of 7.5 s. Hp2-1 gives two picks of 4.4 and 6.5s with molecular weight of 200,000 Daltons (2).

Hp exists in two allelic forms in the human population, so called *Hp1* and *Hp2*; the latter one having arisen due to the partial duplication of *Hp1* gene. Three phenotypes of Hp, therefore are found in humans: Hp1-1, Hp2-1, and Hp2-2 (3). An inert allele, *Hp0*, at the Hp locus has been postulated by studies on the anomalous inheritance of Hp phenotypes, and the homozygosity of *Hp0* has also been suggested as a cause for so-called ahaptoglobinemia.

An allelic deletion from the Haptoglobin gene (Hp) of individual; results into ahaptoglobinemia. The Hp gene cluster consists of coding regions of the a chain and b chain of the haptoglobin gene (Hp) and of the a chain and b chain of the haptoglobin-related gene (Hpr), in tandem from the 50 side. Southern blot and PCR analyses have indicated that the individual with ahaptoglobinemia was homozygous for the gene deletion and that the gene deletion was included at least from the promoter region of Hp to Hpr a but not to Hpr b (Hpdel). Although certain pathological states, such as severe hemolysis and liver dysfunction, are known to lead to secondary ahaptoglobinemia, some reports have claimed that the hypo- or ahaptoglobinemia (Hp0 phenotype) observed in tropical countries has a genetic origin (Allison et al. 1958; Giblett and Steinberg 1960) (4).

The Haptoglobin groups were used in forensic science to solve paternity dispute cases as the inheritance of Haptoglobin is determined by two allelic genes viz. M and N which have co dominant mode of inheritance (5). Also, collection of reliable data is very important in forensic science. If large data is available, any conclusion based on this data is reliable and undisputable (6), (7).

II. MATERIALS AND METHODS

The separation of haptoglobin was carried out using poly acrylamide gel electrophoresis .

With tris glycine buffer system (pH 8.3). This method was developed by Budowle and Chow in 1985 (8) and was improved by Stolorow (9).

I] Apparatus:

Horizontal electrophoresis apparatus (Laurell and Nilehn)

Shandon power pack (constant voltage 500v)

II] Reagents:

All following required chemicals were obtained from Sigma (USA).

Acryl amide (Polymer for gel preparation)

Bis acryl amide (Monomer for gel preparation)

TEMED (Free radical stabilizer)

APS (Ammonium per Sulphate)

Tris (For buffer preparation)

Glycine (For buffer preparation)

Phenolphthalein and Hydrogen peroxide (Indicator) are laboratory reagents.

III] Blood samples:

The blood samples were collected from the population at random such that the selected people will represent the cross section of the population. The blood was collected in sterile eppendorff tubes. These tubes were centrifuged to separate serum from the blood. The serum was stored at -20° C in eppendorff tubes for further use.

IV] Preparation of hemolysate:

The hemolysate was prepared from blood obtained from blood bank. Blood was centrifuged and cells were washed with physiological saline. Heme was released by lysing RBC using equal volume of distilled water.

V] Test sample preparation:

One drop of serum separated by centrifugation from the blood under investigation was mixed with one drop of hemolysate. The tube was incubated at 37° C for 20 mins before electrophoresis to make sure the bond between Heme from blood occurs with haptoglobin from serum.

VI] Method:

Electrophoresis: The plates used for PAGE were washed thoroughly with distilled water. 8% polyacryl amide gel was prepared using Acryl amide, Bis acryl amide, Tris buffer, APS and TEMED. Horizontal plates were prepared with sandwich gel technology using plastic spacers. These plastic spacers create wells for the sample application. 10µl samples were loaded in each well using micropipette. Plate was placed in electrophoresis apparatus. The electrophoresis was carried out at 4° C for 5 hrs at 500Volts

Staining: The peroxidase like activity of hemoglobin is used to identify hemoglobin haptoglobin complex. Hence phenolphthalein and hydrogen peroxide are the reagents used as indicators. After electrophoresis, the gel was layered with

phenolphthalein for one min. The excess of phenolphthalein was decanted and then plate was layered with hydrogen peroxide to obtained pink coloured bands.

III. OBSERVATIONS

The complete study in this research paper is carried out using Tris –Glycine buffer system. Previously Haptoglobin studies were carried out using barbiturate buffer (11). Results obtained with suggested new buffer i.e. with Tris Glycine buffer system are equully good and give highly resolved pattern oh Haptoglobin. The results obtained are reliable and reproducible. Hence; laboratories without specialized equipments and experts can still obtain highly resolved Hp bands from serum. Also, Tris Glycine buffer is non hazardous and non poisonous buffer system hence; continuous contact with Tris Glycine will not be harmful for people working continuously with it.

Stains like amido black, benzidine also can be used but staining with phenolphthalein is easy and convenient as the reagents are harmless and readily available.

The haptoglobin typing for 500 samples was carried out. Mainly three different Hp types were obtained from the studied population. The results are as follows.

Table 1: Different Hp phenotypes observed in the study

Hp Type	No of people	% obtained
0-0	70	14
2-1	80	16
2-2	350	70
1-1	-	0

As it was observed in previous studies (15); in this study also Hp 2-2 phenotype dominates the population. Hp 2-1 type is much lesser than Hp 2-2 type. Surprisingly changes in phenotype Hp 0-0 and Hp 1-1 are observed. Earlier no Hp 0-0 was observed but our study shows this increase up to 14%.

IV. RESULTS AND DISCUSSION

As we know in science and also in forensic science the collection of reliable data is very important. If large data is available, any conclusion based on this data is reliable and undisputable. Therefore there is a need to generate more systematic data bank. This paper is an effort in the same direction. The additional information obtained through this experiment will either help to strengthen the previous findings or if there are any different findings then it will open up new doors for the scientists to work in so far explored directions.

Tris Glycine buffer is non hazardous and non poisonous buffer system hence; continuous contact with Tris Glycine will not be harmful for people working continuously with it.

Population study for Maharashtra was carried out by Malvankar et. al where 395 samples were studied (11).

Table 2: Comparison of the DATA obtained to determine the gene frequency of Hp from the same geographical areas.

Hp Type	% obtained in recent studies	% obtained in previous studies (11)
0-0	14	0
2-1	16	24.87
2-2	70	71.99

1-1	0	3.14
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In that study no sample was observed with Hp 0-0. Where as our population study shows 14% of the population is of the type Hp 0-0. This change in trend need to take in the consideration as far as the population study is concern from forensic point of view. The results obtained from earlier studies (Malvankar et al.) from population of Maharashtra showed that 71.99% of population was of Hp 2-2 type, 24.87% was of Hp 2-1 type and 3.14% population was of Hp 1-1 type. (11)

Comparing the obtained results which are also from the population of Maharashtra, we can say that; the % of Hp 2-2 type are almost similar ie. 70%. Surprisingly changes in phenotype Hp 0-0 are observed. Earlier no Hp 0-0 was observed but our study shows this has increased up to 14%. This significant increase in Hp 0-0 phenotype is certainly due to the changes in the genotype. Hence the gene frequency is changing for haptoglobin in the population of Maharashtra. During our recent studies no Hp 1-1 is been observed where as it was 3.14% of the total population in earlier population study of Maharashtra. Occurrence of Hp genotype can be found out by finding the gene frequency as shown in the following table.

Table 3: Hp gene frequency

Genotype	Gene frequency
Hp 0	0.21
Hp 1	0.08
Hp 2	0.71

V. CONCLUSION

- Haptoglobin typing for the population of 500:
 - Hp 2-2 = 70%
 - Hp 2-1 = 16%
 - Hp 0-0 = 14%
- The gene frequency for Haptoglobin:
 - Hp 2 = 0.71
 - Hp 1 = 0.08
 - Hp 0 = 0.21
- Changes in genotype of Haptoglobin are observed by looking at the gene frequency and comparing them with previous studies. Further more study with more number of population needs to be carried out regarding the same subject to get better idea of gene expression. Also study can be carried out on the basis of sex, caste and religion to observe the trends in the genotype accordingly.
- The numbers of observations examined are too low to arrive at any conclusion. But the significant differences in the observations indicate more deep study.

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First Author- K. J. Joshi, M.Sc. Biochemistry, Directorate of Forensic science laboratory, Mumbai, kjbioc@yahoo.com

Second Author- B. T. Shah, M.Sc. Biochemistry, Directorate of Forensic science laboratory, Mumbai, bhavesh.dude@hmail.com

Third Author- Dr. (Mrs.) V.R. Rathod, Ph.D., Directorate of Forensic science laboratory, Mumbai, varsha_rathod@hotmail.com

Correspondence Author-- K. J. Joshi, kjbioc@yahoo.com, krupalijjoshi@gmail.com, +91-8329028730.

Overview of World Health Systems

Khaled Ennajar *, L.Nessef **

* PhD, Candidate
** PhD

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Abstract- Health care has become the most important public value. Many governments are facing necessity for changes in the entire social system. Today health insurances are models that are few decades or even a hundred years old. This is a review of modern health systems around the world.

Index Terms- Bismarck's model, Semashko's model, Beveridge's model, Private health insurance, Obamacare, Health Savings Accounts, Medisave, MediShield, MediShield Life, ElderShield, Medifund

I. INTRODUCTION

The constitutional and political framework of a country determines the shape of its health system. Different systems have their own management and accountability components.

In European Union countries, health care has become the most important public value. Consequently, the way of organizing health services has become a key element of a political organization. At the end of the 1990s, the French government was knocked down because of attempts of unpopular reforms in the health care system. In 2002, the election victory of the Social Democratic Party in Sweden was partly due to their main electoral slogan that guaranteed full access to health services for all citizens.¹

In the countries of former Eastern bloc, radical changes are taking place. This stems from necessity of introducing changes in the entire social system. In these countries, process of decentralization in health sector mainly consists of financing health services and paying contributions. The new method of financing is mainly through health insurance, which is introduced by independent collection agencies. With the way of contracting services, insurance companies influence changes in payment of contributions. The result of a negative impact on equity and coverage of health insurance often encourages Eastern European governments to withdraw earlier given authorizations.²

The OECD has given the division criteria for the health care systems, which includes the coverage of population by healthcare and rights from health care, sources of financing

health systems and ownership of buildings and equipment in health care.³

Throughout history, five basic models of health systems have been identified:

- Bismarck's model (1883) of basic social (health) insurance,
- Semashki's model (1918) of the national health system in centralized-planning economies (socialist-health insurance),
- The Beverage Model (1948) of the national health system in market economies (national health services),
- voluntary / private market-oriented insurance model (sixties and seventies) and
- mandatory opening of medical / health savings accounts (Singapore 1984)⁴

II. BISMARCK'S MODEL

Bismarck's model is the oldest health insurance system, and it originated in Germany (Prussia) in 1883. It was named after Otto Bismarck, former Chancellor of Prussia, who first applied it. The basis of this model is compulsory social security funded from insurance funds. Health insurance funds collect funds and pay for services. Funds are collected from employee and employer contributions from gross income, and the state pays health insurance fund of health services for protected population groups.

Payment of contributions is proportional to revenues, and this system allows fairness according to principle of financing according to the possibilities. In this type of insurance, principle of solidarity is the most important, which means that contributions are paid by everyone and those who need it during the year. This system generally guarantees fairness in the use of

¹ Totić Ibrahim, (2012), Neka pitanja u vezi sa finansiranjem sistema zdravstvene zaštite u zemljama članicama Evropske unije, Medicinski Glasnik, Specijalna bolnica za bolesti štitaste žlezde i bolesti metabolizma Zlatibor, vol. 17(43), str.42-56.

² Ibid

³ Jovičić Katarina, (2014), Osnovna pitanja zdravstvenih sistema u evropskim zemljama, Sistemi zdravstvene zaštite i zdravstvenog osiguranja- Upporedno-pravna analiza u evropskim zemljama, str.12-16, Institut za uporedno pravo, Sindikat lekara i farmaceuta Srbije, Gradska organizacija Beograda, Beograd

⁴ Jovičić Katarina, (2014), Osnovna pitanja zdravstvenih sistema u evropskim zemljama, Sistemi zdravstvene zaštite i zdravstvenog osiguranja- Upporedno-pravna analiza u evropskim zemljama, str.12-16, Institut za uporedno pravo, Sindikat lekara i farmaceuta Srbije, Gradska organizacija Beograda, Beograd

health care other than those who do not have a right to health insurance.⁵

Health facilities and equipment are mainly state-owned. The countries in which this model is represented are Germany, the Netherlands, France, Austria, Belgium, Luxembourg, Slovenia.⁶

III. SEMASHKO'S MODEL

This model originated in the Soviet Union and countries of Eastern and Central Europe that had socialist social order. Semashko advocated the view that socialist state institutions are obliged to provide everyone in the country with the best possible free health care services.⁷

In socialist system, the property was state-social, so it was with the infrastructure in health care, and all health services were available to every member of society. Health services are financed from a tax-filling budget. The government is directly responsible for the amount of funds allocated for health. The planning of allocation of funds and investment management was under the jurisdiction of state administration.⁸

As negative characteristics of this model, it can be emphasized:

- insufficient utilization of primary health care, and excessive hospital treatment,
- mismatch of health services with the needs of population,
- deviation from international standards in the quality of health services and the amount of salaries paid to healthcare employees,
- limited access to modern technology,
- inadequate planning of trained personnel per population.⁹

This insurance system has been overcome as a market dysfunctional with the reforms that took place in countries of Eastern and Central Europe.¹⁰

⁵ Čepić, D., Avdalović V., (2009), Zdravstveno osiguranje, Zbornik radova Fakulteta Tehničkih Nauka, Novi Sad, ISSN 0350-428X

⁶ Čepić, D., Avdalović V., (2009), Zdravstveno osiguranje, Zbornik radova Fakulteta Tehničkih Nauka, Novi Sad, ISSN 0350-428X

⁷ Saltman, R.B., Busse, R. and Figueras, J., (2004), Social health insurance systems in western Europe. Berkshire/New York: Open University Press/McGraw-Hill.

⁸ Atanasković N.,(2009), dostupno na Karakteristike zdravstvenih delatnosti i zdravstvenih organizacija, Naučni časopis urgentne medicine, Halo 94, XV(34) ,avail. at

https://www.beograd94.rs/images/casopis/2009/Halo94_2009_02.pdf

⁹ Saltman B.Richard,Josep Figueras,Constantino Sakellarides, (1999), Critical Challenges for Health Care reforms in Europe.2, Buchingkam, Open Universiti Press ,str 229.

IV. BEVERIDGE'S MODEL

A system known as the Beveridge model began to form in the early twentieth century, formally since 1942 when it was applied in England by William Beveridge. The characteristics of the Beverage model are: it is financed from state budget, there is public control, coverage of the population by health care is complete, as well as free access to health services.¹¹

Ownership of buildings and equipment in health care is state-owned. The state manages, organizes and plans health capacities as well as activities that the national health service needs to implement. Accent is on primary health care. The general practitioner is in the center of this system and is paid according to the number of services rendered. All citizens have access to health services on equal terms.¹²

Countries that use this model as the core of their health systems are United Kingdom, Ireland, Canada, Denmark, Finland, Sweden, Italy, Spain, Portugal and Greece.¹³

V. PRIVATE HEALTH INSURANCE

The characteristics of this model are: market conditions of financing, small coverage of population with health insurance with a large number of uninsured residents and dominantly private ownership of buildings and equipment in health care. In private health insurance, everyone pays for themselves, and the amount of the premium is determined by the health risk that a person carries (eg. smokers, obesity, diabetics, and those with inborn disorders and diseases are assessed as carriers of high risk and pay higher premiums than other insured persons).

Doctors apply a number of preventive diagnostic procedures to protect against possible lawsuits for patients for wrong treatment, their insurance is expensive and increases the cost of health services. About 20% of Americans do not have health insurance. The health care system of the USA has a lot to do with the latest achievements in the field of medicine, paying much attention to controlling costs and strict adherence to procedures in the application of pharmacological and therapeutic procedures. Great efforts are being made to preserve public health, promote preventive measures and constantly emphasize the needs and advantages of leading a quality way of life, without tobacco smoke, narcotics, alcohol, excessive obesity.

¹⁰ Čepić D., i sar., (2009), Zdravstveno osiguranje, Zbornik radova Fakulteta tehničkih nauka, Novi Sad, 2134-37, UDK: 005.368

¹¹ Jovanović S.,(2015), Sistemi zdravstvene zaštite, Engrami, vol 31(1),avail. at <http://scindeks-clanci.ceon.rs/data/pdf/0351-2665/2015/0351-26651501075J.pdf>

¹² Jovanović S.,(2015), Sistemi zdravstvene zaštite, Engrami, vol 31(1) ,avail. at <http://scindeks-clanci.ceon.rs/data/pdf/0351-2665/2015/0351-26651501075J.pdf>

¹³ Simić Snežana,(2008), Zdravstveni sistemi, Redovna nastava iz socijalne medicine, Medicinski fakultet Univerziteta u Beogradu, ,avail. at

http://wwwold.med.bg.ac.rs/dloads/nastavni_socijalna/Predavanj_a/dec08/5god/ZDRAVSTVENI%20SISTEMI.pdf

Medicare and Medicaid are free health care systems in the United States that provide basic health care to the most vulnerable groups of the population. These programs are very costly for the state and burdens the budget, so a reform that has reduced the rights of the beneficiaries, and at the same time the salaries of the medical workers who worked within these programs, is also under the reform, their number is minimally reduced. In 1999, the Medicare program provided the elderly beneficiaries with the opportunity to purchase medication.¹⁴

The Health Care Act known as Obamacare was made as part of Barack Obama's Health Reform, which began in November 2013, and by April 2014, it resulted in the entry of 7 million new insurers. This law stipulates that there are two public health insurance at the federal level, Medicaid, intended for the poor and Medicare, intended for those over 65 and younger with disabilities.¹⁵

Under this health care law, individuals who have a health problem or do not have the means to cure because of their already existing medical problem or low income will receive subsidies from the government. Each individual will be required to be insured, regardless of age and health status.

Obamacare predicts that an insurance house will pay for emergency intervention, preventive examinations, vaccinations, diabetes testing. As the number of insured million has increased, and the total amount of money for health services is higher, it is estimated that the costs of the most expensive procedures will be cheaper. Employers with over 50 employees are obliged to provide a share in insurance, and employers will in turn receive tax incentives depending on the amount of allocation per employee. Since the beginning of the implementation of the law, about 20 million new insurers have been reported and the number of unsecured fell from 16 percent in 2009 to 8.9 percent in 2016.¹⁶

For those to whom employers did not provide insurance or do not have conditions for free insurance (Medicaid), it is possible that, through newly established health insurance web site, can choose an appropriate offer. The Supreme Court supported the interpretation of the Obama law that subsidies apply throughout the entire territory of the United States, regardless of whether the federal state has set up a stock exchange or uses the one set up by the government.¹⁷

VI. HEALTH SAVINGS ACCOUNTS

Health savings accounts represent a form of allocation for healthcare through personal accounts that can be used exclusively to cover health care costs.¹⁸

The healthcare system of Singapore has long been valid for maybe the best health care system. It is organized as a combination of private and public. The state health care program is based on three principles:

- financing those who are not able to afford health insurance,
- required health savings covers 85% of the population, and
- it is state-financed insurance¹⁹

The state promotes a healthy lifestyle and works a lot on prevention, while on the other hand it allows competition between hospitals (even public) and allows for the formation of prices on the market.

The Government of Singapore has planned and successfully implemented strategies that require integration of activities of the most government ministries, thus building a good health system. This is the way in which the current health care system has been designed and built.²⁰

In Singapore there is the Central Savings Fund (CPF). It was founded during British colonial rule as a compulsory savings program for workers to ensure a comfortable retired. Individuals extracted five percent of their salaries into the fund and their employers followed them with the same amount. The money collected could have been raised at the age of 55. Over time, the government has expanded the program, raising the levels of contribution and allowing the funds to be used for house purchases.²¹ The CPF has become one of the key pillars of social stability.

Medisave - Singapore's Individual Health Savings Plan. Medieval is the expansion of the Central Savings Bank. Medisave is a mandatory medical savings account for Singapore employees.²² Workers allocate a certain percentage of the contribution (subordinated by the government) to their accounts, and thus their employers. The money can then be used to pay for health services, as well as in health insurance plans. Medisave allows patients to pay their share of their health account. It also has an effect in terms of preserving a low level of state health

¹⁴ Joksimović Z., & Joksimović V., (2007), Prikaz najznačajnijih sistema zdravstvenih osiguranja, Glasilo Podružnice Srpskog lekarskog društva Zaječar, Zaječar, vol.32.br.4,p.183-188.

¹⁵ BBC, (2016), Why is Obamacare so controversial? ,avail. at <http://www.bbc.com/news/world-us-canada-24370967>

¹⁶ ObamaCare Facts: An Independent Site For ACA Advice, (2016),.avail. at <http://obamacarefacts.com/obamacare-rate-review-80-20-rule/>

¹⁷ ObamaCare Facts: An Independent Site For ACA Advice, (2016),.avail. at <http://obamacarefacts.com/obamacare-rate-review-80-20-rule/>

¹⁸ Haseltin W.A., (2013), Affordable Excellence The Singapore Healthcare, Ridge Books SingaporeBrookings Institution Press Washington, D.C

¹⁹ Ibid

²⁰ Liu C., Haseltin W.A,(2017), The Singaporean Health Care System, International Health Care System Profiles, The Commonwealth Fund, avail.at <http://international.commonwealthfund.org/countries/singapore/>

²¹ Liu C., Haseltin W.A,(2017), The Singaporean Health Care System, International Health Care System Profiles, The Commonwealth Fund, avail.at <http://international.commonwealthfund.org/countries/singapore/>

²² Ibid

care costs by transferring a large proportion of the costs to individuals and their employers.²³

MediShield is a voluntary non-option insurance program that protects patients in case of catastrophic illness; it is designed to protect patients in most highly subsidized hospital departments; premiums are low and there is lifelong coverage of benefits, deductions, co-insurance, and accounted for Restrictions apply, and additional insurance is available through private insurance companies.²⁴

MediShield Life replaced MediShield in November 2015, and it provides:

- Better protection and higher payouts, so patients pay less from the Medieval fund for large hospital bills,
- Protection of all citizens and permanent residents in Singapore, including
- Protection for life.

MediShield Life is the basic health insurance plan managed by the CPF, which helps pay large hospital bills and selected expensive therapeutic treatments, such as dialysis and chemotherapy.²⁵

ElderShield is a private insurance program that is tightly regulated by the government and provides protection against long-term care costs. All residents of Singapore with Medisave accounts are automatically enrolled in ElderShield when they are 40 years old, unless they give up the scheme. ElderShield is a serious disability insurance scheme aimed at providing basic financial protection to residents of Singapore who need long-term care, especially in old age. Severe disability is the inability of an individual to perform at least three of the six activities related to the uninterrupted daily life independently, with or without auxiliary means. This means that it will be needed, the help of another person in carrying out these activities (swimming, dressing, feeding, moving, going to the toilet and getting up). This is a standard widely used by private insurers offering such disability insurance schemes.²⁶

Medifund is a security network in the system, it is an endowment fund by the government designed to help with medical account problems, its value in billions of dollars. Funds from the fund can be used by certain hospitals, nursing homes and health facilities that use funds for poor patients. The free market in health care allows to control costs and maintain a high quality of service, as it is attended by both private and public hospitals.²⁷

The government determines the percentage of different classes of classes, sets guidelines for care together with the price of services in public hospitals. The government determines the

number of beds in public hospitals, prior to the procurement of expensive technology, approval must be sought, public hospitals have pre-defined budgets for subsidizing services, patients can make a choice because they are well acquainted with costs.²⁸

The Singapore healthcare system is financed through public and private spending, the government helps individuals to pay for their care through a subsidy system, and provides direct funding to public hospitals, clinics and other institutions in the form of compensation for the treatment of patients. Singapore has a precisely regulated number of medical students and a number of doctors licensed in Singapore, neither the price nor the control of salaries are carried out through prescription drugs.²⁹

AUTHORS

First Author – Khaled Ennajar PhD, candidate

Second Author – L.Nessef PhD

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²⁵ Ibid

²⁶ Ministry of Health of Singapore, (2018),*Eldershield.*, avail. at https://www.moh.gov.sg/content/moh_web/eldershield.html

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²⁹ Ibid

Low knowledge and awareness of the male partners in maternal and child well-being programmes as a drawback to their participation in the programmes in Kiambu County, Kenya

Dr. Kagendo J. Francis¹; Prof. Leonard M. Kisovi² and Samuel C.J.Otor³

¹Geography Department, Kenyatta University

²Geography Department, Kenyatta University

³Department of Environmental Sciences, Kenyatta University

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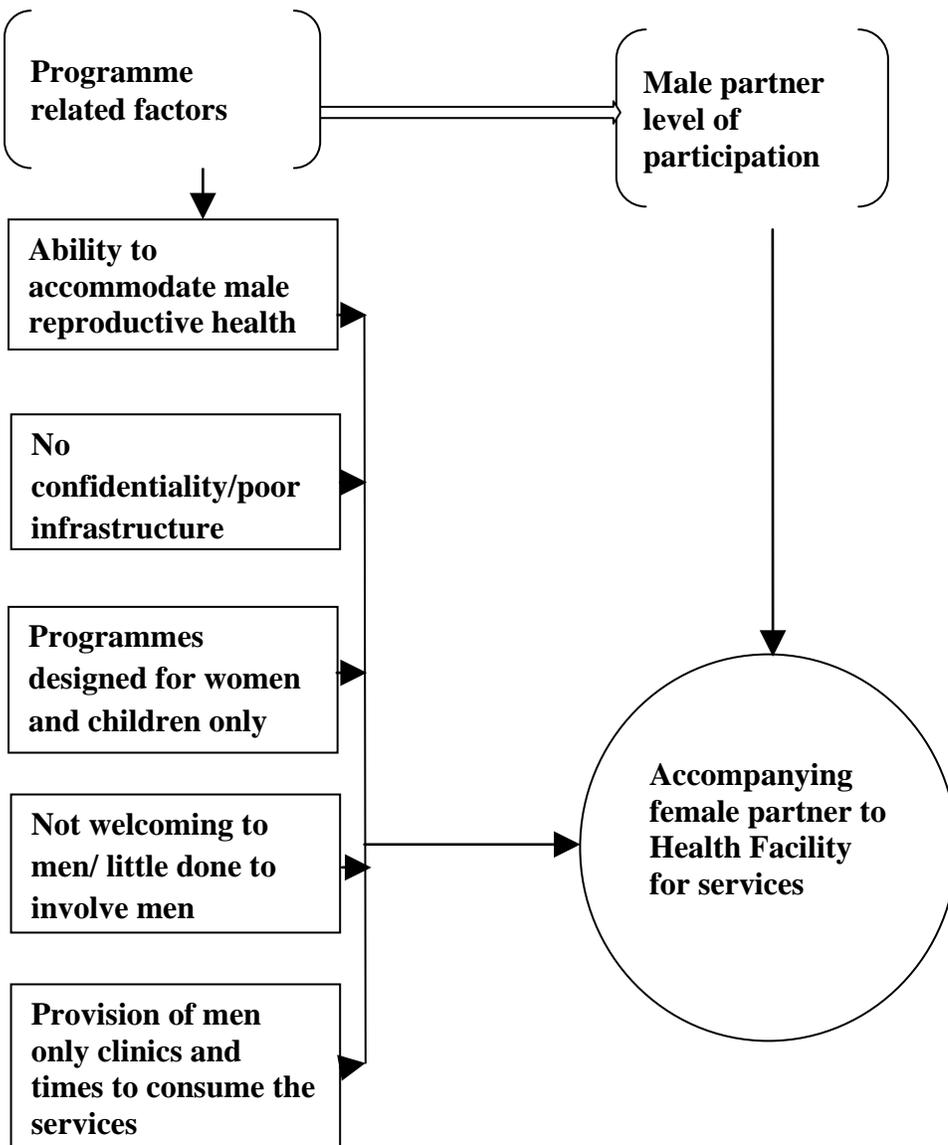
Abstract- Globally, high maternal and infant morbidity and mortality rates have more often than not been associated with the low consumption of services offered within the maternal and child well-being programmes. Inability of the mothers to register for the programmes has partially been implied on the low support accorded to them by their male partners. Male partner participation in the programmes is on the other hand associated with increased consumption of the services and the subsequent reduction in maternal and infant morbidity and mortality rates. Most of these phenomena is reported in developing countries most of which are located in Sub-Saharan Africa. In Kenya, only 47% of mothers receive the recommended (WHO) services during pregnancy and delivery. This has been associated with high maternal and infant morbidity and mortality rates. In Kiambu County, Kenya, where this study was carried out, low male-partner participation in the programmes was identified as a major challenge to successful implementation of the programmes by the County Government. Many factors could be implied for low male partner participation however this study sought to establish if male partners' knowledge and awareness in the programmes and of their role in the programmes had a significant influence on their level of participation in the programmes in Kiambu County, Kenya. The study adopted a cross sectional descriptive analytical design. The target population was males who were partners to females nursing babies aged five years and below. The study collected quantitative data from a sample of one hundred and forty two respondents. The study findings revealed that male partners who had knowledge and awareness in the programmes and in their role reported a higher level of participation in the programmes compared to those who did not. Male partners' knowledge and awareness in the programmes and in their role was found to have a significant negative effect on their level of participation. The study therefore recommends that the County government of Kiambu and the Kenya national government to endeavour to increase knowledge and create awareness to the male partners and the general population on the importance of male partner participation in the programmes. This will mainly be done through supporting their female partners who seek the services for themselves and the infants. This is likely to improve male partner level of participation leading to subsequent increase in level of consumption of the services by their female partners and the infants. This in turn may lead to reduced maternal and child morbidity and mortality rates in Kiambu County and at the National level.

Index Terms- Male-partner, level of participation, Knowledge, Awareness, Maternal and wellbeing programmes

I. INTRODUCTION

The emergence of HIV and AIDS pandemic created even a greater global need to involve male partners in preventing mother to child transmission of HIV [20]. Male involvement has been associated with 40% reduction in MTCT HIV as well as maternal and infant morbidity and mortality rates [21]. It is clear from earlier studies that there is improved uptake of maternal and antenatal care services by creating more awareness to the general public and especially to the male partners on the importance of the services and of their participation [9]. It is difficult to achieve success in these programmes without the male partners' understanding, consent and support especially in the patriarchal societies in Sub-Saharan Africa [5]. For example, it is difficult for the male partner to accept alternative feeding of their child or even support it if he does not understand its importance [4]. Creation of awareness to male partners on importance of supporting their female partners in consuming the services as well as their personal role in the programmes has led to a tremendous increase in the number of women and children who adhered to the programme up to 18 months after delivery [6]. Improvement in male partners' knowledge and awareness in maternal and child health interventions [8] as well as increase in his level of education was found to be a significant determinant of his level of involvement in maternal health programmes [7]. Male partners' involvement in maternal health programmes, had a high likelihood of improving reproductive health outcomes through attending VCT together [3], using condoms to prevent secondary infections during pregnancy and breast feeding [19], delivering at the HF [15] and increase of follow-up visiting during postnatal compared to those without male partner support a factors that emphasized the importance of male partners in promoting the uptake of MCW interventions by their female partners [12]. Lack of information was a significant determinant of male involvement in PMTCT programmes [19]. Level of knowledge on maternal health by male partners was cause of their low level of participation in the programmes [18] which meant that it was important to enlighten men on their roles in promoting maternal and child health [2]. Male partners' perception of maternal and child wellbeing clinics as not "male-friendly," is a narrow focus caused by lack of adequate information on the role of male partners in the programmes [17]. Most HIV and AIDS prevention programmes had overlooked married couples perceiving them to be at low risk making health care providers to pay little attention to encouraging couple VCT attendance [13]. Barriers to male involvement in reproductive health which included perceived side effects of female contraceptive methods, fear and concerns relating to vasectomy, concerns that women's use of contraceptives will lead to extramarital sexual relations as well as limited awareness regarding specific role of men in maternal and child wellbeing programmes which deterred their meaningful involvement in the programmes [11]. Men were generally found to have scanty knowledge in maternal and child wellbeing programmes especially VCT in terms of whom should be involved and why they should be involved. This was attributed to general lack of community awareness in maternal and child wellbeing programmes [5]. A low level of awareness on the programmes among male partners was a drawback to their level of involvement in HIV counseling and testing and their involvement with pregnant women during pregnancy [2]. Access to media is an important correlate of male level of involvement in MCW services because increase in their knowledge and awareness in maternal and child wellbeing programmes and of their role was found to have positive influence on their level of participation in the programmes [19]. Men's misconception that their female partner's HIV status is a proxy of theirs is caused by lack of knowledge on couple discordance in HIV status and was a drawback to their participation in Couple VCT [1]. Male-partners who had knowledge on how MTCT of HIV occurred and how it could be prevented recorded a higher involvement in PMTCT of HIV compared to those who did not have the knowledge [12].

Increase in levels of awareness among the males on importance of participation in maternal and child health led to increased levels of involvement in reproductive health and AIDS prevention in sub-Saharan Africa [13]. In order to improve male involvement in the maternal and child health programmes, barriers such as low awareness on the role of male partner and the unwelcoming attitude of Healthcare providers had to be changed [10]. Lack of information on the programmes was a limiting factor to male-partner active participation in maternal and child wellbeing services [3]. Men felt left out in matters of MCW because they lacked accessibility to information and only received second hand information through their female partner [1]. Men lacked understanding of the MCW programmes and even the roles they were expected to play in the programmes and as result they associated their participation to the traditional paternal attributes such as assuring family protection and financial support [1, 14]. They did not associate it with physical attendance to the clinics and mutual communication of related issues with their female partner [1]. Lack of awareness of the role male partner in antenatal clinics was a drawback to the active participation in the programmers [16]. There is need to create awareness to the general public and specifically to the male gender on their role in the programmes leading to beneficial effects of their participation such as reduced post-partum depression and improved utilization of maternal health services [14].



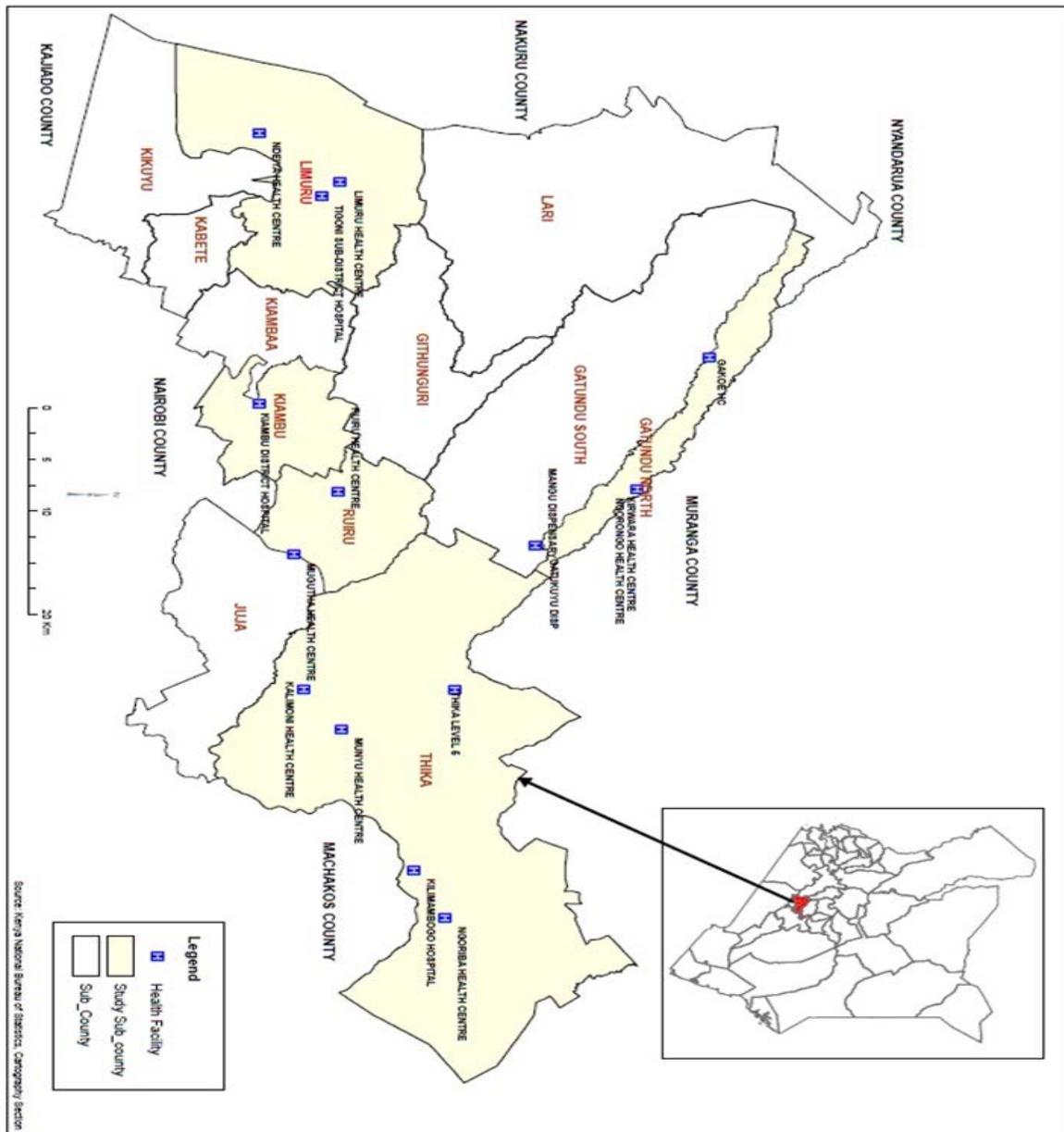


Figure 1. The Conceptual framework

Figure 2. Map of the study site

II. IDENTIFY, RESEARCH AND COLLECT IDEA

The study adopted an analytical cross-sectional design to enable it establish existing relationships between the outcome variable (male-partner's level of participation in maternal and child well-being programmes in Kiambu County) and the predictor variables (effect of male-partners' knowledge and awareness in the programmes).

The study collected both qualitative and quantitative data from the one hundred and forty two respondents. The study target population was male partners to female-partners who were consuming maternal and child well-being services in level four and five health facilities in Kiambu County at the time of study. Primary data were collected from one hundred and forty two respondents using

structured interview guides. More data were collected from the previous literature. Descriptive statistics (frequencies and percentages) were applied on the collected data to help in establishing relationships between outcome and predictor variables. Bi-variate cross tabulations were also used to determine relationships between the variables. The data was also subjected to Chi-square test to establish statistical significance of the relationships between the variables. The study further applied logistic regression analytical technique to help identify the linear combination between the variables. The correlation coefficient was used to determine the type of relationship between the predictor and the outcome variable.

III. WRITE DOWN YOUR STUDIES AND FINDINGS

The study findings show the relationship between male-partner’s knowledge and awareness in various MCW programmes and how this impacted on their level of participation in the programmes. The key findings revealed that male-partner’s knowledge of the programmes and of their role in the programmes were significant determinants of their level of participation. For instance the effects of male partners knowledge on; time within the pregnancy when a mother was expected to attend antenatal clinic had a significant influence indicated by a χ^2 value of 7.882, df1 (0.005) and R=0.236 (0.000). The role of male partners in the maternal and child wellbeing programmes had significant influence at χ^2 value of 11.224, df1 and a p value of 0.001 and R=0.281 (0.001), Table 1.

Table 4.51 Table 1. Effects of male partner’s knowledge on their role in MCW on their level of participation

Participation		Knowledge on role of male partner		Total
		Know	Don't Know	
Low participation	Count	42	36	78
	% within participation	53.8%	46.2%	100.0%
	% within knowledge on role of male partner	50.0%	62.1%	54.9%
	% of Total	29.6%	25.4%	54.9%
High Participation	Count	42	22	64
	% within participation	65.6%	34.4%	100.0%
	% within knowledge on role of male partner	50.0%	37.9%	45.1%
	% of Total	29.6%	15.5%	45.1%
Total	Count	84	58	142
	% within participation	59.2%	40.8%	100.0%
	% within knowledge on role of male partner	100.0%	100.0%	100.0%
	% of Total	59.2%	40.8%	100.0%

Male-partners’ knowledge on the need for couple’s VCT had significant influence at a χ^2 value of 8.801 df1 (0.003), effect of knowledge and awareness in couple discordance in HIV status had a significant influence at a χ^2 value of 41.243 df1 (0.000) while knowledge on importance of delivery at the HF had significant influence at a χ^2 value of 12.944 df1 (0.000). Results from the descriptive statistics as well as from the Chi-square test revealed a significant negative relationship between independent and the dependent variables. The Respondents who had low level of knowledge and awareness in the programmes and in their role were less likely to register a high level of participation compared to those who had a high level of knowledge and awareness.

Table 2. Summary model for knowledge and awareness

Model Summary	
-2 Log likelihood	169.84
Cox & Snell R Square	0.165
Nagelkerke R Square	0.221

Source: Author, 2015

Table 3. Logistic regression for dependent variable and male partner's knowledge and awareness

	B	S.E.	Wald	df	Sig.	Exp(B)
Meaning of MCW(1)	0.454	0.092	24.352	1	0.000	1.575
Time pregnancy (1)	1.073	0.445	5.814	1	0.016	2.924
Services availability(1)	0.792	0.344	5.301	1	0.021	2.208
MCW consumption(1)	0.328	0.145	5.117	1	0.024	1.388
MCW_HIV(1)	0.537	0.248	4.689	1	0.030	1.711
MCW importance(1)	0.612	0.212	8.334	1	0.004	1.844
Importance of male participation (1)	0.609	0.286	4.534	1	0.033	1.839
Importance of couple VCT(1)	0.536	0.176	9.275	1	0.002	1.709
Couple discordance in HIV status (1)	1.167	0.512	5.195	1	0.023	3.212
ARV MTCT(1)	0.272	0.402	0.458	1	0.499	1.313
Importance of delivery at HF(1)	0.126	0.441	0.082	1	0.775	1.134
Breast feeding(1)	0.19	0.441	0.186	1	0.667	1.209
Transmission BF(1)	0.875	0.225	15.123	1	0.000	2.399
Role of male(1)	0.545	0.178	9.375	1	0.002	1.725
Pregnancy prevention(1)	0.784	0.337	5.412	1	0.020	2.190
Transmission delivery(1)	0.857	0.323	7.040	1	0.008	2.356
Constant	1.696	0.601	7.963	1	0.005	5.452

Results for logistic regression test (Table 3) on the corrected data revealed that, male-partners who had low level of knowledge and awareness on the time of pregnancy their female partners was supposed to attend their first antenatal clinic were 2.924 times less likely to register a high level of participation in the programmes compared to those who had the knowledge. The male-partners who had low level of knowledge and awareness on the importance of male partner participation in the programmes were 1.839 times less likely to register a high level of participation in the programmes compared to those who had the knowledge. The study also revealed that male-partners who had low level of knowledge and awareness on the importance of delivering at the health facility were 1.134 times less likely to register a high level of participation in the programmes compared to those who had the knowledge. The study

revealed that male-partners who had low level of knowledge and awareness on the role of male partners in the MCW programmes were 1.725 times less likely to register a high level of participation in the programmes compared to those who had the knowledge. Male-partners who had low level of knowledge and awareness on prevention of mother to child transmission of HIV during pregnancy were 2.190 times less likely to register a high level of participation in the programmes compared to those who had the knowledge. The study findings also revealed that male-partners who had low level of knowledge and awareness on had low level of knowledge and awareness on prevention of mother to child transmission of HIV during delivery was 2.356 times less likely to register a high level of participation in the programmes compared to those who had the knowledge.

Discussion

The study findings suggest that it is difficult to achieve success in maternal and child health programmes without male-partners' knowledge of the programmes and of their role in the programmes].Creating awareness to the general public and to the men on importance of male participation in maternal and child programmes and of the need to support their female-partner is likely to lead to increased number of women and children who consumed the services and adhered to the programmes up to 18 months after delivery. Male-partners who accompanied their female-partners to the clinics expected to benefit through knowing their HIV status as well as protecting their infants from infection in case the mother was infected. Increasing knowledge and awareness to the male-partners on the perceived benefits of programmes could increase their participation. The findings showed that male-partners who had the correct knowledge about the programmes played a major role not only in reducing the partner's risk of acquiring HIV but also in uptake of ANC, VCT and MTCT prevention programmes. The study realized that male-partners who lacked or had inadequate knowledge and awareness on how MTCT of HIV takes place or may be prevented during breast-feeding may not support their female-partner in providing appropriate feeding for the infant. They ended up leaving the whole burden of seeking health care to their female-partners. The study also realised that male-partners who lacked or had inadequate knowledge and awareness on how MTCT of HIV takes place or how it may be prevented during breast-feeding did not support the female-partner in providing appropriate feeding for the infant. The findings of the study showed that male partners' knowledge on prevention of MTCT of HIV through various programmes influenced their level of participation in the programmes. The study found a positive and significant relationship between knowledge on importance of ARVs in preventing MTCT of HIV and overall male participation in the programmes. Male-partners with correct knowledge registered a higher participation in MCW programmes than those who did not have the knowledge. This is a challenge in prevention of MTCT of HIV because such male-partners may not seek to know their HIV especially when they are aware of their female-partners'. They perceive their female-partners' HIV status is a proxy of theirs. The study results imply that there is a positive and significant relationship between knowledge on couple discordance in HIV and overall male participation. Male-partners who had knowledge on couple discordance registered higher levels of participation than those who did not have the knowledge. If there is HIV discordance between such partners, then male partners are likely to infect the female-partners and the foetus during pregnancy and the infant during breast feeding. The study found that male-partners who had the correct knowledge on couple discordance in HIV were more likely to seek HIV testing even when their female partners' statuses were sero-negative. This explained the absence male-partners at the VCT centers because they perceived their female-partners HIV status represented theirs. The study further revealed that there is a significant relationship between male partners' knowledge on the importance of delivery at the HF in preventing MTCT of HIV and overall participation in the programmes. Male-partners who had this knowledge recorded a higher level of participation in encouraging their partner to deliver at the HF than those who did not have the knowledge. The study results imply a positive significant relationship between knowledge on prevention of MTCT of HIV and overall male participation in the programmes.

Conclusion

The study sought to examine the influence of male-partner's knowledge and awareness in maternal and child well-being programmes on his level of participation in maternal and child well-being programmes in the County.

The results indicated that male-partner's knowledge and awareness in the programmes and on their role in the programmes were significant determinants of his level of participation in the programmes. Specifically, male partner's knowledge and awareness in couple HIV discordance, their role in the MCW programmes; knowledge on MTCT of HIV and on how to prevent it had significant positive relationship with their level of participation. Male-partners who had the knowledge registered a lower percent of low level of participation compared to those who did not have the knowledge. These findings led to rejection of the null hypothesis that male-partner's knowledge and awareness in the programmes and in their role did not significantly influence their level of participation.

The study concludes that, there is need to identify priorities in reproductive healthcare provision putting into consideration male-partners' most pressing reproductive health needs. The programmes may pay attention to male-partners' goals, their routes of action and the culturally acceptable practices that can create positive impact. There is need to carefully consider the male-partners' acceptance of the intended health promotion interventions before their implementation in order to increase acceptability. Community specific channels such as peer educators and men leaders may be trained and supported to work with professional healthcare providers in all different phases of the programmes.

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APPENDIX

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AUTHORS

First Author – Dr. Kagendo Jane Francis (Ph.D), Kenyatta University -janendeke@gmail.com .
Second Author Prof. Leonard Musyoki Kisovi, (Ph.D), Kenyatta University- kisovimusyoka@gmail.com.
Third Author –Dr. Samuel Chuuk Otor, (Ph.D) Kenyatta University -cjotor@yahoo.com.

Correspondence Author – Dr. Kagendo Jane Francis (Ph.D), Kenyatta University -kagendo.jane@ku.ac.ke, +254721576267

U.S. Nuclear Policy Towards South Asia Under Obama

Dr. Leena Merlin

* MG University

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Abstract- The purpose of this study is

1. To analyze the major challenges faced by the nonproliferation policy at the global and regional level.
2. To critically review the nature and dimensions of nuclear proliferation in South Asia.
3. To study incoherent U.S. nonproliferation policies and in appropriate influence strategies that have encouraged other states to advance their nuclear weapon capabilities.
4. To study the current trends in U.S. nonproliferation objectives in south Asia.
5. To analyze how the paradigm shifts in U.S. nonproliferation policy towards India has occurred.
6. To study how American scholars and policy experts understood and reinterpreted the nuclear estrangement with India that enabled the policy change.
7. To study how the U.S. national interests were constructed that necessitated nuclear cooperation with India.

I. INTRODUCTION

For the first time since the end of Cold War, the top priorities for American nuclear policy put Pakistan in the spotlight. The Obama Administration realized that the nuclear security environment within and around Pakistan is of significant concern to the United States. During the Cold War, the United States worked with Pakistan to meet common security challenges in Afghanistan and the region. But the advent of Non-State Actors in the security dynamics of South Asia, especially in Pakistan forced the United States to a new look at its nuclear strategy. United States realized that Pakistani territory and the surrounding region emerged as a hot spot for the sub-national radical Islamist groups that oppose the United States and its allies. Pakistan's limited and tenuous control of much of its territory, the growing strength of radical Islamist groups in Pakistan, the poor state of Pakistan's economy, and ongoing political turmoil among Pakistani political elites all undermined Pakistan's ability to effectively control radical Islamist elements and to ameliorate growing environmental, economic, and other stresses. Pakistan's status as a nuclear weapon state, its traditional enmity with India, and proximity to Afghanistan and the West Asian region all heighten its importance to U.S. strategic interests.

When President Barack Obama launched his new strategy on Afghanistan and Pakistan in Washington in late March 2009, there was a reinvigorated interest in the regional dimensions of

the problem. The Bush administration had a rather myopic view on the role of Pakistan's neighborhood: it was one issue and one country at the time, in contrast to the more comprehensive perspective that Obama announced. In 2009 President Obama emphasized the importance of the region and his willingness to work with all parties, to stabilize Afghanistan and to prevent Pakistan from imploding. The appointment of Richard Holbrooke as US Special Representative to Afghanistan and Pakistan came with strong signals of a regional turn. The most concrete measures suggested in the March 2009 White Paper were a regional Contact Group and a new forum for security and economic cooperation, neither of which has come to existence by late 2010. For over three decades, Afghanistan has been a battleground in which many of the states of the larger neighbourhood have been involved. The importance of fostering a concerted effort for Afghan peace and stability is increasingly agreed upon. Some analysts emphasize states and their security relationships and see Afghanistan as an insulator caught between different regional state systems, each with a strong dynamic of their own. An alternative perspective which also seems to inform the new US analysis emphasizes various transnational networks, and sees Afghanistan as the core of a larger conflict formation.

II. POST COLD WAR ERA AND SHIFT IN US STRATEGY

The end of the cold war dramatically changed the nature of international relations by ending superpower patronage of local combatants. Foreign policy of many powers had undergone dramatic changes. This change is more visible in U.S. policy towards South Asia, especially the American approach towards Pakistan. In fact the transformation of the global order in general and the changes in the foreign policies objectives of the major powers in particular have influenced the nature and quality of the relationship with the vast majority of the developing countries. The restructuring of the U.S. global strategic agenda has left a great impact on Pakistan. The fact is that Pakistan's relevance to U.S. global interest has diminished significantly (Hagerty :1996). It is evident from the application of the Pressler Amendment to Pakistan in October 1990, when the U.S. President refused to certify Pakistan's nuclear programme as peaceful. Many factors influenced Washington's approach towards Pakistan (Arnett: 1997). During the cold war Pakistan became the 'frontline' state for furthering U.S. interests in South Asia and Middle East. In the early 1980's Pakistan's importance for the United States increased in view of the Soviet invasion in Afghanistan, the anti-

US Islamic revolution in Iran and the Indo-Soviet economic and security co-operation, Islamabad assumed a centre stage against the US activities against the Soviet in Afghanistan. In addition, it was included in the security consensus in the Gulf along with Saudi Arabia and US to enable the oil rich Arab Gulf states to defend themselves against the threat of Islamic fundamentalism. The collapse of the Soviet Union drastically changed the conditions that had made Pakistan relevant to US global policies. Simultaneously, India began to project the compatibility of Indo-US security and economic interests in the South Asian region. It is interested in developing a multi faceted partnership with the U.S.(Koshy: 2005).

In the post-cold war international environment Pakistan finds itself less relevant to U.S. foreign policy objectives. It is seen as a supporter of Islamic fundamentalism and a serious violator of the nuclear non-proliferation norms. The U.S. concerns over international terrorism and nuclear proliferation effects three areas of Pakistan's interests: Afghanistan, Kashmir and its nuclear programme. The issue of nuclear proliferation occupied the prime agenda of the Clinton administration. Pakistani nuclear strategy was its supreme-priority because of the fluid political situation and its growing nexus with Islamic militant organization. The Clinton administration took several steps to force Pakistan to adopt a nuclear restraint regime in South Asia (Rajan: 1991). In the 1980's, the US overlooked Pakistan's nuclear programme due to their common concern against the Soviet Union. However, Pakistan did assure the US that it would neither detonate a nuclear device nor transfer nuclear technology to any other country. In December 1981, the U.S. Congress approved an aid for Pakistan by waiving application of the Symington amendment for six years. On the expiry of this period, the waiver was extended for another two and a half years(Hassan: 1995). A broader policy consensus on how to drive the Soviet Union out of Afghanistan overshadowed the U.S. non-proliferation agenda. This created an impression among the Pakistani nuclear establishment that its covert nuclear programme could not be a serious impediment in developing the strategic relationship with the United States. But the demise of the cold war and the Soviet withdrawals from Afghanistan forced the United States to refocus its nuclear non proliferation goals in South Asia, especially towards Pakistan. Pakistan also adopted a new policy for pursuing its nuclear agenda. They adopted a new nuclear strategy by using the nuclear card in its confrontation with India in the 1990 crisis (Duranti: 2001). This led to a hasty intervention by the U.S. and the other western powers, pressuring both New Delhi and Islamabad not to escalate their confrontation.

The new nuclear strategy proved successful. Thus the crisis of 1990 was a watershed event in Pakistan's national security strategy. Nuclear weapons were no longer considered merely a trip wire of last resort in the case of a major invasion of the country. Instead nuclear weapons became a key to Islamabad's assertive strategy of escalation of the struggle in Kashmir under a nuclear umbrella restraining Indian retaliation. In 1991, Islamabad considered the New World Order advocated by the U.S. and especially in the call for non-proliferation, a strategic threat to its independence. The new world order does not allow any country in the third world except the American surrogates to possess nuclear weapons(Dunn: 2000). Fully aware

that no single country can confront the U.S. on its own, Islamabad stressed the growing significance of nuclear and military co-operation with other radicals as a profound issue of confrontation with the U.S. Islamabad acknowledged that "Peoples Republic of China and North Korea have been supplying Iran and other Muslim countries with medium range missiles and nuclear technology for peaceful purposes. This co-operation now strengthened as the source of strength for Islamabad's defiance against U.S. pressures, for any alternative would be detrimental to the future of Islam. The Pakistani establishment believed that, if Pakistan surrenders before the Americans with respect to the nuclear programmes, there will be no limit for such a surrender, because the American's endeavour to demolish Pakistan's military power and make her a banana republic so that the Muslim world should be enslaved by the U.S. imposed world order"(Bodansky: 1995).

It was in this context of this strategic perception that the Pakistan military nuclear capabilities were finally admitted officially. On 21 October 1991, Pakistan, for long a known yet not an acknowledged nuclear power, crossed the line and created a precedent. In a Karachi meeting, Dr.Abdul Quadeer Khan, the father of Pakistan bomb, officially acknowledged that Pakistan was a nuclear power(Ziring:2005).Subsequently, the nuclear factor has become a clear and critical factor in the Pakistan national strategy, especially vis-à-vis India and the United States. The United States followed a tough posture towards Islamabad following this development. The U.S. administration could no longer make the certification required by the Pressler Amendment, and the United States military assistance came to a sudden halt. No future contracts could be signed, and all of the equipment already in the pipeline was placed on hold. Besides the F-16 fighter aircraft the equipment included three U.S. Navy P-3C military aircraft, 28 Harpoon surface – to – surface missiles, 360 AIM-9 L "sidewinder" air – to – air missiles and other assorted minor items and spare parts(Lippman W: 1995). By the time Clinton administration took over in 1993, bilateral relations with Pakistan were badly frayed as a result of the standoff. Debate raged in the administration over how to break the impasse. The non-proliferationists particularly those at the Arms control, and Disarmament Agency, felt that administration should only make concession in exchange for concrete results on the Pakistani nuclear issue. The regionalist, particularly in the State Department Bureau of South Asian Affairs and the Department of Defence argued for a more multi faceted approach to the U.S. policy towards Pakistan that would allow greater co-operation in the areas of drugs, terrorism, peacekeeping and military training (Reiss: 1995). While the regionalist perspective prevailed in the administration, the non-proliferationists led by senator Glenn and senator Pressler, were stronger in the congress. In the House, although representative Hamilton was sympathetic to Pakistan. Representative Benjamin Gilman and several key staffers on the House International Relations Committee strongly supported the Pressler Amendment. Each of the camps enjoyed strong network both between branches and with ethnic and arms control interest groups, including the Pakistani and Indian embassies and their professional lobbyists, all of whom followed the debate closely(CRS : 1996).The issue first came to a head in 1993 when the Clinton administration decided to submit to Congress a broad rewrite of the Foreign

Assistance Act. In late 1993 and early 1993 following repeated crises in Haiti, Somalia, Bosnia and elsewhere, relations between the Congress and the Clinton administration were at particularly low ebb. The redrafted act was widely seen by members and staff as an attempt by the executive branch to reduce, or at least challenge the role of Congress in foreign affairs. It was not well received (Doherty J.: 1994)

Barack H. Obama assumed office as the President of USA in the month of January 2009. As the new U S president he promised change and transformation in global nuclear proliferation. The Change which he said was seemingly imminent as the already gone decade had been completely crisis ridden with various contingencies created by the former U S President George W. Bush's strategic vision, in which the U S relied on unilateral methods like Preemption as a policy doctrine that have guided his nonproliferation nuclear policies as well. Former President George W Bush's major preference for unilateralism began to be viewed as a draconian phenomenon when his counter proliferation initiatives camouflaged political underpinnings like various regime changes. President George W Bush ambitiously promoted active defense and nuclear weapons modernization that eventually triggered the whole new levels of global instabilities instead of enhancing continued peace and security and even resulted in curbing proliferation. President Barack Obama initiated several change in the foreign policy and nuclear security aspects and he began to initiate a transition to reconciliation and engagement. Beyond changing the preliminary steps of the U S nonproliferation policy, his aim was to replace U S arsenal through the reliable warhead programme. In his April 5 Prague speech, President Obama called for the United States to lead international efforts toward a world free of nuclear weapons. A new Council on Foreign Relations-sponsored Independent Task Force report, co-chaired by former secretary of defense William J. Perry and former national security adviser Brent Scowcroft, says that while "the geopolitical conditions that would permit the global elimination of nuclear weapons do not currently exist," steps can be taken now to diminish the danger of nuclear proliferation and nuclear use. To achieve this radical goal, Barack Obama promised the world to take a 360 degree ultimate turn by reviving the Non Proliferation Treaty, also by ratifying the CTBT and taking courage in activating a Fissile Materials Cut off Treaty (FMCT). One of The most radical ideas that he had, however, was his new proposal to make a sweeping number of reforms in the area of nuclear security, this included the tangible steps to make sure that global security of nuclear materials within a period of four years. Barack Obama also promised the global community that a new nuclear energy architecture design which could accommodate a global chain of fuel banks and even the proliferation resistant recycling technologies at the top end. Most of the above promises were made in a poll mode. But still the U S president took many courageous steps towards these security goals in his first tenure in office. Starting with the first Prague speech that he delivered on April 5, 2009, it was at a venue which was to hosting the Nuclear Security Summit and also signing of the renewed strategic arms reduction treaty (START) in the month of April 2010, U S diplomacy was fully at functional mode to prove that Barack Obama really meant business. And at the same time, there were a toned down and very much delayed Nuclear Posture

Review (NPR) which was succumbing to the needs of military establishment's writ. There were several early indications of Barack Obama's propensity to completely compromise and take up the middle line; he often went on reverting to his predecessor's policies, which began to raise questions regarding the total feasibility of the Obama doctrine. This doctrine, which is still in its evolving stage and it is potent enough to discomfit countries, especially those countries like India whose terms of engagement with the non proliferation entities should potentially be redefined. As Far from its initial fears of being cornered on both the NPT and CTBT, the New Delhi has gained some confidence and they are now abide by the non proliferation norms that are democratic.(J Perry:2012). The U S president Barack Obama's political philosophy is really inspired by the liberal generations' that rose in U S during the period of 1980s that got into the U S campuses for opposing star wars and arms races. He even wrote in the Columbia University magazine which is a highly validated one, *Sundial*, about his future vision for a nuclear weapon free World, he always rallied against first and second strike capabilities, and he was really agitated for elimination of global nuclear arsenals. After Two decades, he still continued his activism as a Senator with liberal ideals, he also did not sustain the same fury against nuclear weapons. (P.Shultz:2010)

III. TENETS OF OBAMA'S NUCLEAR POLICY

After assuming the office of president, President Barack Obama used several numbers of platforms to depict his own nuclear policy. His Prague speech was a landmark and it was an indication for the U S change of policy. The Prague speech was a declaration of intent wherein he officially made out his future plans for a nuclear weapons free world vision, in which, he also believes, that it might not come about in his lifetime.

(a) *Toward the disarmament goal*

In Prague speech, President Barack Obama declared that the U S is always prepared to initiate the move towards a nuclear weapons free world, by starting to reduce the number and role of nuclear weapons in its security strategy. President Barack Obama, however, also made it so clear that as long as the nuclear weapons and its related devices exist, the U S will continue to maintain the most secure, reliable and effective deterrent. The number of nuclear weapons reduction process began with a new strategic arms reduction treaty (START) with the Russia which has the potential to bring down the amount of strategic nuclear warheads to be around 1,500 and 1,675 on both sides. In one such month of marathon nuclear diplomacy, he also released NPR and even hosted a Nuclear Security Summit. These were all in April 2010. The newly initiated START program was signed with Russia on the month April 8, but the issue was that the START programs its ability to clear the U S Congress was under real stress, because the Republicans were constantly questioning the *quid pro quo* on missile defence systems and they were even demanding more and more funding for the nuclear weapons modernization programs along with tighter verification articles in the treaty. Similarly, the NPR came without much expected momentum in order to reduce the salience of nuclear weapons in U S security planning. The main

issue is that the document only *commits* to further reduction of their roles in deterring a non nuclear attack, but it also clarifies that any such policy that stress a ‘detering only’ nuclear attack as the sole purpose of nuclear weapons is unrealistic. The Convention, most probably is the rarest of instances when the U S had endorsed the possibility for a standalone legal treaty to pursue the final phase of nuclear disarmament. (A Vinodkumar:2010)

(b) Reviving treaties

Obama gave out his intentions on Non proliferation treaty In Prague in which he said that the basic bargain of the Non proliferation treaty is to sound the countries which are having nuclear weapons will need to move towards disarmament, and the countries that doesn’t have any nuclear weapons should not acquire them, and all the countries in world eventually can access peaceful nuclear energy. To strengthen the Non proliferation treaty, he said in his speech that, “We need more and more resources and also the authority to strengthen international inspections. We need immediate consequences for countries breaking rules or trying to leave the treaty without cause”. This message was really lucid for violators and deserters and he even advocated that they should be punished and the treaty needs a structural strengthening in a holistic way. There were also other areas that are required to have an immediate redressal as well. These redressal actions should include addressing the ongoing conflict between stringent nonproliferation obligations and the increasing constraints on the access to nuclear trade. and this means that they need to effectively deal with threats from the non state actors too. This was something that Non proliferation treaty was not structured to tackle. The persistent expositions made by the president Barack Obama and his own new non proliferation team during the first year in the office, for strengthening the core three pillars of the Non proliferation treaty, their effort started to raise hopes of a grand Barack Obama plan to reinstate the treaty. FMCT is an internationally verifiable treaty that is capable enough to end the production of weapons grade fissile materials that are seen as the other half of the incremental steps towards disarmament. Barack Obama has already declared his whole hearted commitment to conclude the FMCT, which has already being negotiated at the Conference on Disarmament in an effective manner. (Robert Gates:2010)

(c) Nuclear security and terrorism

President Barack Obama firmly believes in the biggest security risk in the 21st century which is not a rogue country with long range missile systems, but of a terrorist group smuggling a very crude nuclear device across the international borders. Announcing about his nuclear security options in Prague, Barack Obama even declared his insight to secure all sorts of vulnerable nuclear materials, globally, within a time limit of four years, and augment initiatives like the Proliferation Security Initiative (PSI) and the Global Initiative to Combat Nuclear Terrorism (GICNT), ‘in order to stop the smuggling of nuclear materials, phase out highly enriched uranium from the civilian sector, and also to break up nuclear black markets which exists in the world, he also initiated projects to detect and intercept materials in transit and use the financial tools to stop such trade’. The plan was to create a counter proliferation and cooperative threat reduction under the frameworks like the United Nations Security Council Resolution 1540. But for this ambitious target which has been designed to

secure all sorts of nuclear materials globally with in a four year time frame. (Kenneth N Lungo 2009)

(d) Counter-proliferation

It was crystal clear from Obama’s campaign days that he will not devalue his senior president Bush’s counter proliferation initiatives and also the cooperative policing and interdiction efforts, which are considered to be the primary function of the PSI and Container Security Initiative (CSI). President Barack Obama seeks to magnify their scope of peaceful non proliferation efforts through cooperative enhancement and Strict levels of institutionalization. A structured PSI is a stronger PSI, he made this comment in his campaign and also stated that, “will produce greater international intelligence and policing cooperation, maintain tougher export controls and criminal penalties for violations, and apply the tools developed to combat terrorist financing and shutting down proliferators’ networks”. For an effective border and a better transformational security Barack Obama promised organizational basing and financial support for the CSI and Mega ports Initiatives. In one of the pre election interview, Barack Obama said: “We spend billions on missile defence, but far too little on securing nuclear materials around the world and improving security at our ports and borders”. The PSI, although, had some of the notable mentions when linked to the broader nuclear security plan. The Ballistic missile defense systems are another major stage where Barack Obama has several numbers of dilemmas. As a senator, Barack Obama had voted for major reductions in BMD programs, and he was also non committed with regard to George W Bush’s missile deployment plans. Barack Obama said in his campaign that “We must seek a nuclear missile defense and demand that those efforts use resources wisely to build systems that would actually be cost-effective and will work”. (Greg Mello:2010)

(e) Nuclear energy

As one among the core pillars the third pillar of the Non Proliferation Treaty, President Barack Obama supported the expansion of the civilian nuclear energy projects and he even detests any hindrance that are made to the civilian nuclear cooperation. And during his speech in Prague, Barack Obama also said, “No approach will succeed if it’s based on denial of right to nations that play by rules”. In order to facilitate the civilian nuclear energy renaissance, Barack Obama announced a new civilian nuclear energy cooperation framework which chiefly comprising international fuel banks and fuel-supply promises, enabling all those signatory countries to access nuclear energy without increasing any of the nuclear weapons proliferation risks. According to a credible Interpretation by experts, fuel banks could be acting as an energy equivalent to a nuclear umbrella with the development rights being only restricted towards a privileged few, just as in the case of all the nuclear weapons. Since more nuclear non proliferation obligations impeded civilian nuclear trade, Barack Obama could have eventually realized that the need to trade carefully while pushing fuel banks and fuel cycle banks. (M.Grossman:2010)

Besides all the inherent challenges which are present in his move, in each segment of policy making, the Barack Obama doctrine could also be challenged by its unrealistic approach weaknesses. Further, the various divergent perceptions within Barack Obama’s government on how to turn his vision of a

nuclear Weapons free world into a reality could be seen as a potential spoiler.

(f) Pushing a Utopian dream

Barack Obama's assertion was that the nuclear disarmament will not happen in his lifetime because it has a retrograde effect. Critics even questions on the matter that whether Barack Obama's intentions are genuine or whether it will be remaining as mere concept. At this point of time there could be three perceivable reasons behind his policy:

- a) Total elimination cannot happen at one stroke as this will not be a consensual or sequential movement among the nuclear weapon states.
- b) Incremental steps towards elimination, involving test ban and fissile material cut-off, would mean a long haul;
- c) New nuclear armed states and security dynamics might emerge which could reverse the reduction process.

The main point, here to be examined could be that will Barack Obama work towards pursuing a non proliferation structure in his entire lifetime or will there be any sorts of credible steps towards total Elimination of nuclear weapons? As an alternative way he could have adopted the Nuclear Weapons Convention (NWC) that has more potential to work towards his goal that could facilitate a standalone treaty for nuclear disarmament. (Josh Rogin:2009)

IV. DISARMAMENT VERSUS A ROBUST NUCLEAR DETERRENT

Barack Obama had tried to push through a completely new nuclear policy which was consistent with his nuclear disarmament vision. Barack Obama's security establishment is something which keep on insisting and maintaining a robust nuclear deterrent and also by modernizing the nuclear weapons complex before even achieving any reduction benchmarks. The modernization of nuclear weapons debate is a carryover from the George Bush's administration; it had conceptualized the RRW program to be something that has replaced ageing nuclear warheads with brand new ones. The then Defence Secretary Robert Gates, who was in the same office in the George Bush's administration, is a person who vouched for nuclear weapons modernization. The amount of diversity in opinions in the political and military establishments is not without constant crises crossing. A bipartisan consensus was in favour of the reduction and a minimized role for nuclear warheads were highlighted in the Congressional Strategic Posture Commission, headed by William Perry, who, however, recommended that the sustenance of a strong deterrent with an effective advice that the use of modern age nuclear weapons should be only be in extreme conditions. The sentiments of the U S armed forces are reflected in a the department of defence (DoD) report of December 2008, which had called upon the incoming administration to define the new age role of nuclear weapons in deterring threats along with 'suitable modernization of the nuclear deterrent force.(DoD report:2008)

By agreeing to such sorts of budgetary and modernization pressures, Barack Obama signaled his willingness to step down from his already stated positions on the nuclear arsenal, opening up funding for nuclear complex modernization which eventually

manifests in stockpile the modernization of these weapons. Though RRW plans have already been shelved, the most important fact is that the Barack Obama's administration began to endorse the shortcomings of the present life extension methods which already begun to increase the prospects for a later decision to construct new modern warheads. When faced with this amount of crisis over the declaratory policy on nuclear weapons use, a capable warhead modernization call could ultimately derail the whole process of reductions and disarmament of nuclear war heads. Though done with several sorts of nuclear modernization testing, a new warhead creation could project the U S intention to sustain its nuclear weapons arsenal forever while pushing other nations towards reductions. This would undermine its whole operations.(Elaine M Grossman:2009)

V. WHAT OBAMA'S NUCLEAR POLICY AUGURS FOR INDIA

President George W Bush's greatest contribution towards Indo U S foreign relations was his capability to bridge the gaps in the areas where there is divergence in the non nuclear proliferation issues. George W Bush had actually facilitated the Nuclear Suppliers Group (NSG) which is strong organization and amended several numbers of U S laws to in order enable nuclear commerce with India. As a senator Barack Obama supported the nuclear deal, but not before the pushing of 'killer amendments' in the Henry J. Hyde Act which eventually known as Hyde act which plays a key role in Indo U S nuclear relations. This act sanctioned the '123 Agreement' with India. This raised many concerns that Barack Obama might put more hindrances and interpretational loopholes as the acting president of U S. although the proposed controls over ENR technology transfers had already raised many eyebrows, and his consent for a reprocessing agreement put all of the rest concerns regarding hindrances to the nuclear deal. Washington D.C has time and again clarified that the nuclear deal will be sacrosanct. And all the real challenges, however, lies beneath the surface. Barack Obama's push for a non nuclear proliferation, by reviving the Non Proliferation Treaty and Operationalising the CTBT, could be a major source for a potential clash. At the core of all the current apprehensions is the feeling is that the traditional divergences on non nuclear proliferation will be regenerated during the Barack Obama era.

Integrating India into the non-proliferation regime

The Indo - U S nuclear deal was already supposed to have brought India into the non nuclear proliferation Mainstream talks after the decades of technological and economical isolations. But still India's collaboration with the Non nuclear proliferation regime cannot be assumed to be complete since it still stays apart from its cornerstone the Non Proliferation Treaty. India does not rely on any of the incremental steps towards total elimination of nuclear capability, and it also seeks a new age non nuclear proliferation bargain, which will allow transcending the Non Proliferation Treaty centric system. Even being one key initiator of the Non Proliferation Treaty, still India rejected the treaty, saying that it's a 'flawed bargain'. But India still have been claiming to adhere to the Non Proliferation Treaty's principles and it has been consistently touting its record as a responsible nuclear power. (Joe Biden:2009) Even at the event of ratification

by the U S senate, and similar action done by China and others, India will be under pressure to sign the nuclear non proliferation treaty. But still, with India not likely to immediately get into their track, U S always will have to find different types of means to engage with India for a futuristic positive outcome. These outcomes also include the possibility of a renewed nuclear testing by India or even offering India access to any sophisticated design data and all the simulation capabilities. The problem is that both options are seems to be improbable. Barack Obama is not expected to offer India such sorts of capabilities since it will take away his disarmament objectives. Also, if there is another round of testing done by India then it could potentially result in the complete termination of the whole nuclear deal. On the FMCT, India had made a commitment to join any levels of negotiations in accordance with the July 18, 2005 joint statement. By agreeing so, India made a closed her options to resist the treaty despite the growing concerns over its implications for its strategic nuclear program. India was one among the main co-sponsors of the 1993 UNGA Resolution 48/75L in order to negotiate a non discriminatory and internationally verifiable non proliferation treaty banning all the production of all sorts of fissile materials and related enrichment devises. (Susan Burk:2010)

Divergent perceptions on disarmament

President Barack Obama and India are two major actors who are solely committed to a nuclear Disarmament process, but due to the divergent perceptions there are real difficulties in realizing such an effort. Barack Obama swears by the traditional way of Non Nuclear Proliferation Treaty route, in which entails incremental steps along with continued and phased reduction of existing nuclear arsenals, potentially leading to a total elimination of the nuclear arsenal. India which feels that this route is a cage without any scopes for total elimination but instead a probable reason why Barack Obama himself ruled out the immediate possibility. India totally discourages the Non Nuclear Proliferation Treaty and still believes it could only retain a non nuclear proliferation position which will not be favorable to disarmament. Further, India really feels a test ban without a proper disarmament roadmap will definitely end up as ineffective. Since India passionately pushes for a non Nuclear Weapons Convention that could initiate a standalone treaty for general and total disarmament, consistent with Article VI of the Non Nuclear Proliferation Treaty. But none of the Non Nuclear Proliferation Treaty signatories are enthusiastic about the NWC. India's answer to Barack Obama's blind play is of not achieving disarmament in his lifetime could be the Rajiv Gandhi Action Plan of June 1988, which had then called for total elimination by 2010, implying that such processes could be undertaken within period of 20 to 25 year period. (A Vonod Kumar :2010)

Counter-proliferation

Even after being really supportive towards George W Bush's extensive nuclear policies, India had always been unconvinced about his counter proliferation initiatives. India has always resisted U S intentions which exerted pressure to participate in the PSI, despite being supportive of its principles. The main obstacle to India's participation was that the references which are made to International Atomic Energy Agency (IAEA)

on the matter of comprehensive safeguards in the year 2005 Protocol to the SUA Convention (Suppression of Unlawful Activities at Sea), which India had felt that it could lead to the PSI being targeted at non Nuclear Proliferation Treaty states like itself. (Ashly Tellis:2009)

Obama's response to Indian Nuclear Programme

The Republican Administration's tenure under the president George W Bush should be regarded as a major golden era of Indo – U S relations by signing the major 123 Agreement (Agreement for Cooperation Concerning Peaceful Uses of Nuclear Energy) on October 10, 2008. When President Barack Obama assumed office, a large number of apprehensions have been arisen at that period. When President Barack Obama's focused on the Afghan Pak issues which coupled with India's sensitivity on the cross border terrorism and Kashmir, the global economic crisis with U S in heavy recession and issues relating to outsourcing are some of the major issues that made a real constrict over a fruitful engagement. On the other hand U S was interested to continue talks because of India's relative political and economic stability, a professional armed forces and also a force with high levels of counter insurgency experience has played a great role in creating a leverage with the U S Administration in the backdrop of a huge global financial crack down, industrial slow down, international security concerns particularly in Afghanistan, Pakistan and the Indian Ocean. (Melvin P.Leffler:2009) On the matter of Jammu and Kashmir issue, the Barack Obama's Administration has been convinced that it won't be fruitful to intervene into this matter particularly because of the presence of their valuable and strategic the Pakistan. The successful free and fair Assembly elections in 2008 indicate that the back of militancy has been broken through a comprehensive policy adopted by Indian government and hence the mediation in Kashmir has become totally irrelevant. According to India's economic leverage with the U S has been very important in lots of respects, due to the size and growth of Indian economy. However, Indian influence Can be constrained by the fact that several amounts of sovereign funds are based in the Middle East and China have large amount of shareholdings in most of the American corporations which works in several strategic sectors including the financial sector. The U S is likely to not to go hardliner on the matter of outsourcing, international free trade and economic integration with the World. (Paul K Kerr:2013)

VI. OBAMA'S RESPONSE TO PAKISTANI NUCLEAR PROGRAMME

Since the hard core thrust of the Barack Obama Administration's nuclear weapons policy and also the threat assessment mechanism is mostly targeted on North Korea and Iran, Pakistan has always given significant challenges that will make the ongoing attention during Barack Obama's Second term. In its drive to increase the production of fissile material for nuclear weapons, augment its weapons production facilities, deploy for additional delivery vehicles, also to construct additional nuclear reactors, and expand its reprocessing capabilities, Pakistan has been undergoing serious changes and these are placed for the expansion and improvement of its nuclear weapons arsenal capacity at the core of its overall

nuclear security strategy. When this trend of Pakistan is considered against Pakistan's volatile domestic path way and ongoing regional conflicts, it highlights that there is the need for the Barack Obama Administration to embolden its capacities in assessing and monitoring any threats to Pakistan's nuclear weapons. (Charles D.Blair:2011) The U S has always been in a constant and continued relation with Pakistan that has triggered between necessary coexistence due to the periods of strains in the post 9/11 period. Since the world's fastest nuclear proliferators, is Pakistan it will still continue to become a significant challenge to U S policy makers in the immediate future. Nuclear weapon expert Hans Kristensen estimates that Pakistan has already increased its nuclear weapons capability and increased its nuclear stockpile from an estimated seventy to ninety warheads in 2009 to approximately 90 to 110 nuclear warheads. This has been marked a steady increase from the U.S Defense Intelligence Agency's 1999 projection which placed the number of nuclear weapons with Pakistan is in between an amount of 60 to 80 by the year 2020. Since the Pakistani government had defined the number and type of nuclear weapons that is necessary for it to achieve its minimum deterrent, the Pakistan remains to be in an ambiguous entity for both the U S government and also to the international community. The main motivation behind Pakistan's tendency to increase its nuclear stockpile is much deeper and complex than predicted. There should not be any doubt that its losses to India in three conventional wars over the past six decades were a major driving factor in its determination to develop and maintain its nuclear arsenal. Another such complicating issue is that it pertains to what has been an effective control of Pakistan's nuclear weapons by its military, the military's withdrawal to hand over the control of nuclear sector to the civilian government, and its tendency to each time project the threat from India as the core rationale for keeping such forms of weapons. In essence, for achieving the Barack Obama's "zero" goal, India had to be removed as a projected threat to Pakistan's security. This would also make the Pakistani military to play a small role in the Pakistani political system, and also their concede civilian control over the Pakistan's nuclear weapons. (Hans M Kristensen:2011)

The amplification of Pakistan's nuclear capable warhead designs and related research, development, and production infrastructure has translated into more of a provocative style. This can be clearly seen on the display in late November 2012 when it test launched a medium range ballistic missile which was capable of being armed with high powered nuclear warheads in a complete user trial. After the eighth missile was tested in the year 2012, the operational liquid fueled Ghauri Hatf 5 which is a nuclear capable missile has a range of more than 800 miles and has already engendered all the security concerns on a regional level basis. According to several experts, the Pakistani ambition to accelerate its nuclear arsenal has been motivated by the U S seeking to improve defense ties with India in order to counter act this co operation they are trying to improve their nuclear capabilities resulting in a nuclear threat to whole south Asian Region. (David E Sanger:2012)

VII. NUCLEAR SECURITY SUMMIT

The Nuclear Security Summit (NSS) is a world summit that has international attentions, they are aimed at preventing any sorts of nuclear terrorism all around the globe. The very first summit of Nuclear Security Summit (NSS) was held in U S on the month of April 12, 2010. And similarly there was a second summit that was conducted in Seoul in the year 2012. The third summit of Nuclear Security Summit (NSS) will be held in The Hague on the month of March 24, 2014. In the year of 2009, President Barack Obama in a speech that he gave in Prague even termed nuclear terrorism as one of the greatest threats to international security and peace processes. With that attitude in mind, Barack Obama hosted the very first Nuclear Security Summit (NSS) in Washington DC in the year 2010, in order to draw attention, a global level of attention at the highest level, on the need to make sure that the secure nuclear material should be prevented from nuclear terrorism. Around Forty seven countries from all around the world and three major international organizations participated in the first summit of Nuclear Security Summit (NSS). In the year 2012, the second Nuclear Security Summit (NSS) and this was held in Seoul. In total around Fifty three countries and four international organizations were invited to take part in it. The very first summit of Nuclear Security Summit (NSS) was concerned with making several political agreements, while the follow up of this happened in Seoul which was focused on the progress that are made in implementing these agreements. The third Nuclear Security Summit (NSS), in the city of Hague in the year 2014, which was the centre on the results achieved and future course of action. Under the Nuclear Security Summit (NSS) process, all the countries should work to improve their nuclear weapons and civilian nuclear security on the basis of the Washington's Work Plan, which contains numerous measures and action points. In Seoul a number of additional action points were formulated and set down in the Seoul Communiqué. The Nuclear Security Summit (NSS) process is ongoing, and since 2009 it have required many world leaders and diplomats to devote some of their extra attention to the Raising issue of nuclear security. Extensive consultations were held in the run up to every summit. For Nuclear Security Summit (NSS) 2014 this process had started in the year 2012. The negotiators for the various countries known as sherpas and sous sherpas, they discussed the progress made and even confer on key themes, work plans and measures that are to be adopted in the plan. Ultimately, these negotiations had lead to several effective decisions, which are later confirmed and agreed at the summit and they published it in a communiqué. Forty seven countries and the three international organizations participated in the First Nuclear Security Summit, held in Washington in 2010 at the initiative of President Obama. The aim of this summit was to constantly improve worldwide nuclear security, and find out concrete agreements for securing all the nuclear materials and related facilities. The results of this summit was enumerated in the U S Work Plan in the form of several numbers of concrete action points, and the Washington Communiqué, which contains different levels of commitments and declarations as an intent from the participating countries. The commitments made in Washington in 2010 are:

- the Leaders jointly made sure that the seriousness and urgency to counter the threat posed by nuclear terrorism.
- The participating countries agreed to work to secure all vulnerable nuclear material worldwide.
- The participating countries agreed to shoulder their responsibility for securing nuclear material within their own borders.
- The participating countries agreed to work together as an international community to improve nuclear security.(Inf. On Nuclear security summit:2014)

Following the summit that was carried out in Washington D C in the year 2010 another six new countries like Azerbaijan, Denmark, Gabon, Hungary, Lithuania and Romania, and one new international organization Interpol were invited by South Korea to join the Nuclear Security Summit (NSS). 53 countries attended the second summit in Seoul in the year 2012, which was built on the goals that had been identified in Washington D C. (Bunn Mathew:2012)

VIII. U.S RESPONSE UNDER OBAMA

The U S President Barack Obama has already reviewed Homeland Security policy and then he concluded that those "attacks using improvised nuclear devices IED's pose a serious threat and they are increasing national security risk." In his presidential election period, President Bush and state Senator John Kerry had agreed that the most serious danger facing the U S is the possibility that terrorists could obtain any sort of nuclear bomb from any nuclear black market. (Robert M Gates:2010)

IX. CONCLUSION

There is no point in Imagining a world without nuclear weapons because it is impossible likewise imagining a U S without any nuclear weapons is also impossible. This paraphrase shows the major hindrances that the President Barack Obama faces in pushing his vision of a nuclear weapons free world. Nuclear weapons are definitely an integral part to U S supremacy in a nearing unipolar world. Even in a transition period to a polycentric order, the nuclear weapons will definitely remain the most potent currency of power for U S. The challenge arose for Obama is whether to reconcile such a strategic realities while propelling his political visions which are merely impossible.

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AUTHORS

First Author – Dr. Leena Merlin, MA, Mphil, PhD,
Email:leenamerlin09@gmail.com

Value of endothelial markers in accurate assessment of microvessel density (MVD) and thus angiogenesis in invasive ductal breast carcinoma

T S Rekha, Jayashree Krishnamurthy

Dept of Pathology, JSS Medical College, JSS Academy of Higher Education and Research, JSS Medical Institutions Campus, Sri Shivarathreshwara Nagara, Mysuru, Karnataka, India.

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Abstract- Background: The prognosis of breast cancer is dependent on several clinicopathological factors and molecular markers. Among these, angiogenesis is required for growth, invasion and metastasis of tumor. Microvessel density (MVD) assessment aids to quantify angiogenesis which was measured by Haematoxylin and eosin (H&E), Vascular Endothelial Growth Factor (VEGF) and CD31 in the present study, with an objective to find the best stain among the three.

Material and Methods: The study included forty seven proven invasive ductal breast carcinoma cases. Manual Tissue Microarray (TMA) prepared slides were stained with H&E, VEGF and CD31. MVD were quantified according to Weidner's method and the results were compared with different grades of breast carcinoma and between the peritumoral (PT) and intratumoral (IT) areas.

Results: The mean MVD for H&E, VEGF and CD31 were 4.1 ± 2.7 , 4.5 ± 2.7 and 18.35 ± 7.4 , 95% CI [15.1, 20.1] respectively. Statistically the CD31 stained tumor had highest MVD, which also showed increasing MVD counts with increasing grades ($p < 0.001$) with a significant difference between grade 1 & 3, and 2 & 3 ($p < 0.001$) indicating that high MVD is a predictor of poor prognosis. CD31 IT-MVD (11.3 ± 5.7 ; 95% CI [9.1, 12.7]) was almost two folds higher than the PT-MVD (6.2 ± 2.6 ; 95% CI [5.2, 6.9]). CD31 specifically attaches to the glycoprotein in the vascular endothelial cells that helped in the recognition of the proliferating immature vessels in the tumor centre and mature PT vessels accounting for overall highest MVD, while H&E and VEGF recognized only the mature PT vessels.

Conclusion: We conclude that CD31 recognises both immature and mature vessels by specifically attaching to the glycoprotein in the vascular endothelial cells, thereby measures accurate MVD thus angiogenesis in invasive ductal breast carcinoma.

Index Terms- CD31, Breast carcinoma, MVD, angiogenesis, peritumoral, intratumoral

I. INTRODUCTION

Breast cancer is one of the leading causes of death in women. Clinical and pathological parameters like the stage, grade,

angiogenesis and several molecular biological criteria have prognostic significance. Among these prognostic markers, the role of angiogenesis and the degree of maturity of microvessel are of great interest [1].

Angiogenesis is the development of new blood vessels from the existing blood vessels. It is evident that tumors have a limited capacity to grow without vascular supply which is obligatory to sustain the influx of essential nutrients to the growing cancer mass [2]. It is the fundamental requirement for the growth, invasion and metastasis of solid tumors [1]. Hence research on related factors such as an accurate assessment of microvessel density (MVD), which is used to quantify angiogenesis [3], can help predict tumor behaviour [4,5] and note the effect of antiangiogenic therapy [1].

Quantification of MVD is done by identifying the blood vessels by their morphology on Haematoxylin and Eosin (H&E) sections or by staining the blood vessels with pan-endothelial markers including CD31, CD34, CD105, factor VIII or Vascular endothelial growth factor (VEGF) [6-8]. VEGF is one of the most prominent growth factor that controls both physiological and pathological angiogenesis. CD31 is a marker that selectively detects the glycoprotein of 130kDa [9] in vascular endothelial cells and thereby contributes to the assessment of vascularisation and consequently note the tissue vessel density. Correlation between the degree of angiogenesis, the proliferative activity of endothelial cells forming vessels and the MVD count is not completely understood [10].

The conflicting results in several studies reflect the low specificity of various markers in accurate assessment of MVD and thus angiogenesis. In the present study the role of endothelial markers – VEGF and CD31 in accurate assessment of MVD and thus angiogenesis in invasive ductal breast carcinoma has been verified with an additional emphasis on noting the peritumoral (PT) and intratumoral (IT) MVD.

II. MATERIAL AND METHODS

The study included forty seven cases of radical mastectomy specimens that were routinely processed and proven as carcinoma breast on H&E stained sections. Breast carcinomas were graded as grade 1 to 3 based on tubule formation, mitoses and nuclear pleomorphism according to Elston and Ellis

Modified Scarff Bloom Richardson grading system [11]. Institution ethical committee approval and individual patient's informed consent were obtained.

CD31 and VEGF IHC staining

The sections from all the 47 cases were included in construction of 3 manual tissue microarray (TMA) sections that were immunohistochemically (IHC) stained with VEGF and CD31. In brief procedure of IHC was: Endogenous peroxidase of formalin fixed paraffin embedded tissue sections were inhibited by incubating with 3% hydrogen peroxide for 5 minutes. Heat induced antigen retrieval was performed and sections were incubated for 5 to 10 minutes at room temperature (RT) with blocking reagent. They were incubated with the primary antibodies – CD31 BC2 monoclonal antibody (Biocare medical, Concord CA) and VEGF (Biogenex, AR483 10R) for 30 minutes. Further they were incubated for 30 minutes with a secondary conjugated polymer. Subsequently a chromogen was added and were counterstained with haematoxylin, dehydrated with graded alcohol, cleared with xylene and mounted. For positive control capillary haemangioma was included.

Microvessel density scoring

The H&E, VEGF and CD31 IHC slides were studied to quantify the MVD. The blood vessels were identified based on their morphology in H&E stained sections, while cell membrane and cytoplasmic immunoreactivity of endothelial cells were considered as positive when stained with CD31 and VEGF respectively. The MVD was determined by two independent observers, the screening was done by hot spot method in which the slides were initially screened in low power (x10 objective lens, x 10 ocular lens) to identify the areas with the highest number of micro vessels [12]. The micro vessel count was then performed in these fields under high power (x40 objective lens, x10 ocular lens). The mean value of 10 most vascularised areas at x400 field was considered as MVD for the sample.

Statistical analysis

Statistical analysis by SPSS version 23.0 was calculated. According to the Kolmogorov-Smirnov test, H&E, VEGF and CD31 MVDs had a normal distribution. Statistically MVD obtained by H&E, VEGF and CD31 were assessed for linear association by Pearson's correlation coefficient between each other and by one-way analysis of variance (ANOVA) with the different grades of breast cancer. A p-value of less than 0.05 was considered as significant.

III. RESULTS

Out of 47 cases of breast cancer 4.2% (2) were grade 1, 36.2% (17) were grade 2 and 59.6% (28) were grade 3. The MVD ranges for all three stains were shown in Table 1. The mean MVD \pm SD for H&E, VEGF and CD31 were 4.1 \pm 2.7, 4.5 \pm 2.7 and 18.35 \pm 7.4, 95% CI [15.1, 20.1] respectively (Table 1). Pearson's correlation statistical analysis showed correlation of 0.769 (p<0.001) between H&E MVD and VEGF MVD, correlation of 0.390 (p=0.007) between VEGF MVD and CD31 MVD and correlation of 0.449 (p=0.002) between H&E MVD and CD31 MVD (Table 2).

There was a significant correlation between the CD31 MVD and grades with a p-value of <0.001. Post Hoc test by Bonferroni showed a significant difference between grade 1 & 3, and 2 & 3 with an overall p-value of <0.001 (Table 3).

PT (6.2 \pm 2.6, 95% CI [5.2, 6.9]) and IT (11.3 \pm 5.7, 95% CI [9.1, 12.7]) CD31 MVD correlation had statistically significance with a p-value of <0.001. H&E MVD (p<0.001) and VEGF MVD (p<0.001) showed significant correlation with PT CD31 MVD. The range and mean PT and IT CD31 MVD values in all three grades of breast carcinoma and their correlation analysed was shown in Tables 1 and 3.

DISCUSSION

Angiogenesis is a complex multistep process involving extracellular matrix remodelling, endothelial cell migration, proliferation, microvessel differentiation and anastomosis [13]. Reported data suggest that angiogenesis is an independent prognostic factor in several cancers [14]. Despite several studies there is no definitive angiogenic marker identified for an accurate MVD assessment and investigators have failed to explain the difference of PT and IT MVD.

MVD of a tissue is a reflection of the angiogenesis and in the present study on correlating the MVD counts obtained by three different stains, though there was a highly significant correlation between H&E and VEGF scores (0.769), the high CD31 MVD had low significant correlation with either the H&E (0.449) or VEGF (0.39) scores (Table 2). The mean MVD by CD31 was four folds higher than the H&E and VEGF implicating that CD31 was able to identify all tumor blood vessels thus a better stain of the three, with respect to estimation of angiogenesis in breast carcinoma.

In present study H&E stained sections, the endothelial markers VEGF and CD31 showed increasing MVD counts with increasing grades independently indicating that high MVD is a predictor of poor prognosis (Table 1). These findings are similar to that of Gunasundari and Bhaskar [15] who have reported that there is a significant difference in the mean values of MVD of the various groups defined by Bloom Richardson Grading system. On analysis only CD31 MVD (p<0.001) had statistically significant scores compared to H&E MVD (p=0.225) and VEGF MVD (p=0.769) when correlated with grades reinforcing that CD31 MVD is remarkable. The CD31 MVD in grade 3 breast carcinoma (22.7 \pm 5.3) was higher than grade 2 (12.5 \pm 4.7) and was approximately four folds higher than in grade 1 (6.5 \pm 2.6), (Figure 2). The differences in angiogenic activity were statistically significant between grade 2&3 and grade 1&3 hence reaffirming that CD31 MVD is a good prognosticator as compared with the other two stains (p<0.001), (Table 3).

Further correlating the MVD counts in the PT and IT areas, there was no significant difference noted on H&E and VEGF stains. While there was a significant difference noted with the CD31 stain (p<0.001), and this is similar to the findings of Marwah N et al. [6]. The IT MVD (11.3 \pm 5.7, 95% CI [9.1, 12.7]) was almost two folds higher than the PT MVD (6.2 \pm 2.6, 95% CI [5.2, 6.9], Figure 1c). The high IT MVD suggests that there is relative hypoxia in the central areas of breast carcinoma which would stimulate the expression of HIF-1 α and therefore up regulate a number of downstream angiogenic factors like VEGF, MMP2 etc secreted by both tumor cells and stromal cells [16]. It

was also noted that MVD counts by H&E ($p < 0.001$) and VEGF ($p < 0.001$) stains correlated with the PT CD31 MVD indicating that these stains have identified predominantly peritumoral blood vessels. This difference in the MVD counts in the PT and IT areas is similar to the finding of Margaritescu C et al. [3], Marwah N et al. [6], Schimming and Marmé [17], which is predominantly due to high neoangiogenesis in the tumor centre (Table 1). Though Avdalyan A et al. [1] have recorded a substantial spread of mean values; a study on MVD counts in leiomyosarcoma has shown association of PT MVD with survival, hence an independent prognostic indicator. While Eshghyar N et al. [4] had shown a significant association of IT MVD with the lymph node metastasis.

Neoangiogenesis involves sprouting of endothelial cells that initially form immature vessels that are irregular, tortuous and lack organization [18]. The unlimited tumor growth and therefore the continuous stimulation of blood vessels prevent the endothelial cells from generating a mature vasculature but expand the vascular compartment. Neoangiogenesis is thus a natural consequence in the rapidly growing tumor centre.

In H&E stained sections, blood vessels were identified by their morphology which showed a complete lumen lined by endothelial cells and the presence of RBCs within (Figure 1a). The IT immature vessels lack organization of endothelial cells and failed to be recognized with H&E stain. The lowest H&E MVD of 4.1 ± 2.7 thus recognises only the mature vessels which are predominantly seen in the PT area and fails to recognise the IT immature neovascular vessels.

VEGF was expressed by both the endothelial cells and tumor cells and thus the diffuse staining of the tissue obscures the endothelial cell and fails to recognise the immature vessels in the proliferating tumor centres (Figure 1b). Therefore VEGF though a potent angiogenic marker, is not specific to the endothelial cells. This explains the lower VEGF MVD of 4.5 ± 2.7 which is close to that observed by H&E stain. Hence VEGF stain has no advantage over H&E stain with respect to MVD assessment.

In present study the mean CD31 MVD has the highest value of 18.35 ± 7.4 , 95% CI [15.1, 20.1] and found to stain both the mature and immature blood vessels (Figure 1d). CD31 specifically attaches to the glycoprotein in the vascular endothelial cells that helps recognition of the immature vessels also in the proliferating tumor centre and accounts for the highest IT MVD counts. High vessel density, cell immaturity and structurally abnormal vessels within the tumor tissue have also been cited by Holleman D et al. [19] and Avdalyan A et al. [1]. The variability in the MVD assessment between our study and other authors could be attributed to differences in the patient population studied, methods of MVD assessment and different endothelial markers used such as CD34, CD105 and factor VIII (Table 4), [20-28]. The main limitation of our study was inability to follow-up the patients, hence could not correlate with survival statistics.

Folkman J [29] has proposed that the growth of a tumor and its metastasis are dependent on angiogenesis and hence blocking angiogenesis could serve as a strategic way of arresting tumor growth, hence accurate assessment of MVD is of prime practical importance for today's clinical repertoire, which can be obtained easily by CD31 staining. Eshghyar N et al. has

suggested that patient with higher MVD are candidates for additional therapy with antiangiogenic drugs and follow up [4].

We conclude that CD31 which is expressed by both immature and mature vessels is more appropriate for an accurate assessment of MVD a measure of neoangiogenesis and thereby prognosis in invasive ductal breast carcinoma. A further study with image analysis is essential to eliminate intra and inter observer variability in MVD assessment and the implicit role of angiogenesis in carcinoma breast needs further substantiation.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional ethical committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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AUTHORS

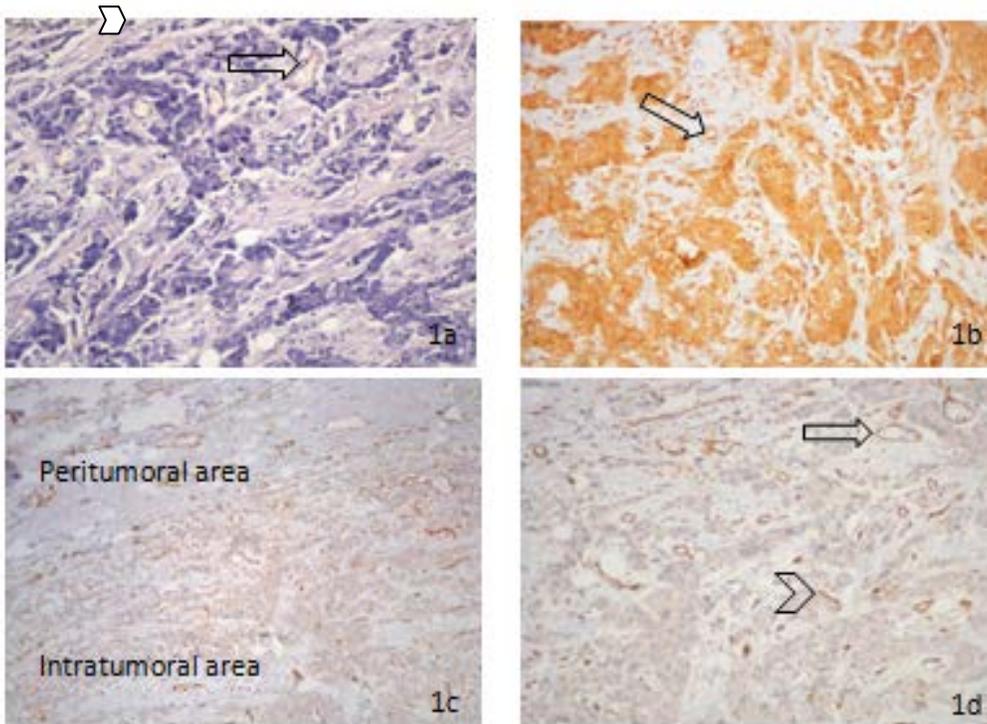
First Author – Dr T S Rekha, Associate Professor, Dept of Pathology, JSS Medical College, JSS Academy of Higher Education and Research, JSS Medical Institutions Campus, Sri Shivarathreeshwara Nagara, Mysuru, Karnataka, India.
E-mail address – rekhats12@gmail.com

Contact No - +91 9448608149

Second Author – Dr Jayashree Krishnamurthy. Prof and Head, Dept of Pathology, JSS Medical College, JSS Academy of Higher Education and Research, JSS Medical Institutions Campus, Sri Shivarathreeshwara Nagara, Mysuru, Karnataka, India., E-mail address - dr.jayashree_k@yahoo.co.in

Correspondence Author – Dr T S Rekha, Associate Professor, Dept of Pathology, JSS Medical College, JSS Academy of Higher Education and Research, JSS Medical Institutions Campus, Sri Shivarathreeshwara Nagara, Mysuru, Karnataka, India. E-mail address – rekhats12@gmail.com
Contact No - +91 9448608149

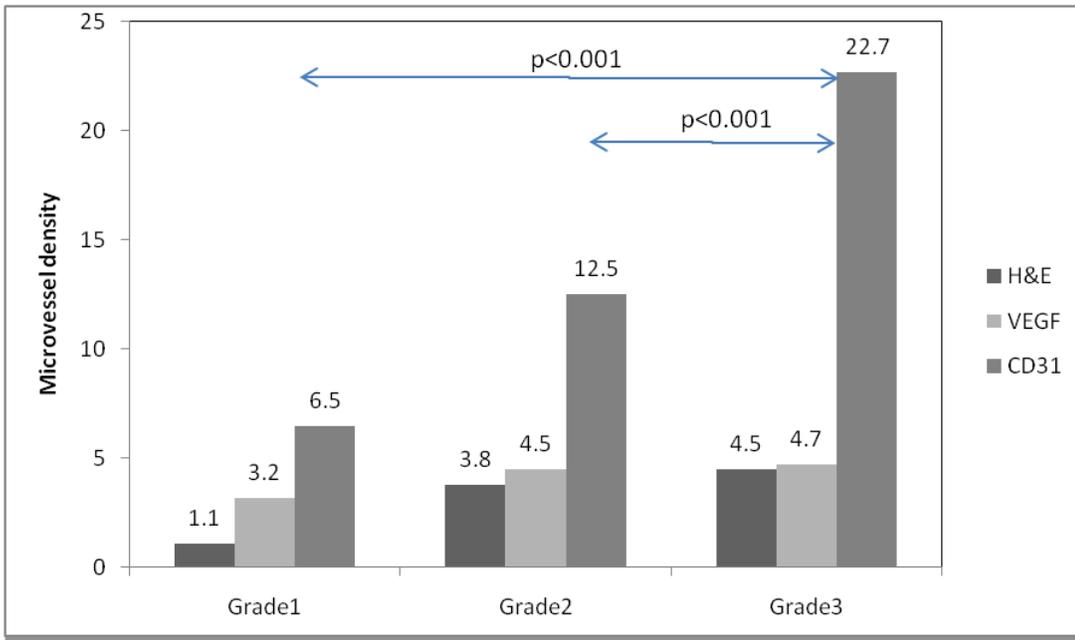
Figure 1. Identifying the blood vessels () (a) H&E 10X A complete lumen lined by endothelial cells and the presence of Red Blood Cells within, (b) VEGF 10X staining of both endothelial cells and tumor cells, (c) CD31 4X showing higher IT MVD compared to PT MVD, (d) CD31 10X stain both the mature () and immature () blood vessels.



H&E – Haematoxylin and Eosin; VEGF – Vascular Endothelial Growth Factor;

PT – Peritumoral; IT – Intratumoral; MVD – Microvessel density

Figure 2. The microvessel density scores of the three different grades of breast carcinoma estimated by H&E, VEGF and CD31 stains and correlation between the three grades of CD31 microvessel density



H&E – Haematoxylin and Eosin; VEGF – Vascular Endothelial Growth Factor; MVD – Microvessel

Table1. The range and mean microvessel density of three different stains, peritumoral and intratumoral areas in different grades of breast carcinoma

	Grade 1	Grade 2	Grade 3	Total
H&E MVD range	0.6-1.6	0.4-9.2	0.4-12.6	0.4-12.6
H&E mean MVD±SD	1.1±0.7	3.8±2.4	4.5±2.9	4.1±2.7
VEGF MVD range	1.6-4.8	0.8-10.2	0.4-9.8	0.4-10.2
VEGF mean MVD±SD	3.2±2.2	4.5±2.9	4.7±2.6	4.5±2.6
CD31 MVD range	4.8-8.4	4.8-18	12-33.8	4.7-33.8
CD31 mean MVD±SD	6.5±2.6	12.5±4.7	22.7±5.3	18.3±4.7
PT CD31 MVD range	1.1-3.2	1.7-10	4.4-13.2	1.1-13.2
PT CD31 mean MVD±SD	2.1±1.4	4.5±2	7.5±2	6.2±2.6
IT CD31 MVD range	3.6-5.2	2.3-13.9	7.5-25.3	2.3-25.3
IT CD31 mean MVD± SD	4.4±1.1	7.5±3.5	14.2±5.1	11.3±5.7

H&E – Haematoxylin and Eosin; SD – Standard Deviation; VEGF – Vascular Endothelial Growth Factor;

PT – Peritumoral; IT – Intratumoral; MVD–Microvessel density

Table 2. Correlations between the three different stains in breast carcinoma

	H&E MVD	VEGF MVD	CD31 MVD
H&E MVD Pearson Correlation	1	0.769	0.449
Sig. (2 tailed)		0.000	0.002
VEGF MVD Pearson Correlation	0.769	1	0.39
Sig. (2 tailed)	0.000		0.007
H&E MVD Pearson Correlation	0.449	0.39	1
Sig. (2 tailed)	0.002	0.007	

H&E – Haematoxylin and Eosin; VEGF – Vascular Endothelial Growth Factor; MVD – Microvessel density

Table 3. Correlation of H&E, VEGF, CD31, peritumoral CD31 and intratumoral CD31 microvessel density with different grades of breast carcinoma

	H&E MVD	VEGF MVD	CD31 MVD	PT CD31 MVD	IT CD31 MVD
Grade 1 & 2	0.546	1.000	0.368	0.382	1.000
Grade 2 & 3	1.000	1.000	<0.001	<0.001	<0.001

Grade 1 & 3	0.293	1.000	<0.001	0.002	0.017
Total p-value	0.225	0.769	<0.001	<0.001	<0.001

H&E – Haematoxylin and Eosin; VEGF – Vascular Endothelial Growth Factor; PT – Peritumoral;

IT – Intratumoral; MVD – Microvessel density

Table 4. Comparison of CD31 microvessel density data of our study with other authors study outcome

Authors	CD31 Mean	MVD	CD31 range	MVD	CD31 MVD and grade
Rajesh L [20]	NA		NA		NA
Yilmazer D [21]	NA		NA		No correlation
Arihiro K [22]	NA		NA		No correlation
Comşa S [23]	NA		NA		p=0.019
Raica M [24]	31.68		9.8-60.2		NA
de la Taille A [25]	60.1		6-184		NA
Gehani KE [26]	80.29		NA		p=0.0001
Choi WWL [27]	29.2		12.8-94.3		p=0.0107
Massi D [28]	17.37		NA		NA

Our study	18.3±4.7	4.7-33.8	p<0.001
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MVD – Microvessel density; NA – Not available

Effect Of Computer-Assisted Model On Upper Basic Iii Students' Attitude Towards Drug Abuse Education In Nasarawa State, Nigeria

¹Samuel, Ruth Iwanger and ²Nurudeen, Jamila Idris

¹Department of Science, Technology and Mathematics Education,
Faculty of Education, Nasarawa State University, Keffi, Nigeria

ruthsa124@gmail.com

²National Commission for Colleges of Education (NCCE), Abuja, Nigeria.

nurujash@gmail.com

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Abstract

This study investigated the effect of Computer-Assisted Model on Upper Basic III Students' Attitude towards Drug Abuse Education. Purposive sampling procedure was employed to select 85 upper basic III students from two public co-education schools in West Senatorial District, Nasarawa State, Nigeria. Quasi experimental design was employed for the study. Two research questions guided the study and two research hypotheses were tested at 0.05 level of significance. Attitude Towards Drug Abuse Education Questionnaire (ATDAEQ) was used as instrument for data collection. The reliability of ATDAEQ was determined using Cronbach Alpha and the coefficient obtained was 0.79 implying that the instruments were reliable enough for the study. Descriptive statistics was used to answer the research questions while the hypotheses were tested using Analysis of Covariance (ANCOVA). The findings of this study revealed significant differences in the attitude of upper basic III students towards drug abuse education. Based on the findings of this study, it was recommended that upper basic teachers should adopt the use of Computer-Assisted Model in teaching so as to improve students' attitude towards drug abuse education.

Keywords: Attitude, Computer-Assisted Model, Drug Abuse, Students

INTRODUCTION

Drug abuse is the excessive and persistent self-administration of a drug without regards to the medically or culturally accepted patterns. It could also be viewed as the use of a drug to the extent that it interferes with the health and social function of an individual (World Encyclopedia, 2004). In essence, drug abuse is the arbitrary overdependence or mis-use of one particular drug with or without a prior medical diagnosis from qualified health practitioners (Abdullahi, 2009).

Drug abuse is a major public health problem all over the world. The use and abuse of drugs by male and female adolescents have become one of the most disturbing health related phenomena in Nigeria and other parts of the world (Ekpenyong, 2012). Several adolescents who persistently abuse substances often experience an array of problems, including academic difficulties in the likes of declining grades, absenteeism from school and other activities, and increased potential for dropping out of school; health-related

problems (including mental health); poor peer relationships, and involvement with the juvenile justice system (Abdu-raheem, 2013). Additionally, there are consequences for family members, the community, and the entire society (Oshodi, Aina & Onajole, 2010).

Research on the effect of drug abuse and students' educational performance revealed that it could lead to reduced academic achievement or even halt their entire academic process (Abdu-raheem, 2013; Ekpenyong, 2012; Oshodi, Aina & Onajole, 2010). Drug abuse has become a threat to the lives and success of the youths in Nigeria. This is evidently a source of sorrow to parents, guardians, relatives and a big challenge to the whole nation. It has therefore become pertinent to educate and sensitize students on the danger of drug abuse using appropriate and innovative teaching strategies such as computer assisted model.

Computer assisted instruction (CAI) refer to instruction or remediation presented on a computer. It is the use computers as an interactive instructional technique whereby a computer is used to present the instructional materials and monitor the learning that take place. It is assisted learning because it allows the learner to interact with instructional techniques. It uses a combination of text, graphics (animation), sound and video in the learning process. Computers could play powerful roles in the child learning in school. That is because it helps to develop learners' potentials in different areas of learning and may also constitute powerful delivery system that may bring about great changes in learners behaviours that are desirable to the society at large. It is noted that, most learning occurs by doing (experimental learning) including getting things wrong as well as getting them right determined by immediate feedback in other words computers appears to be capable of giving almost instant feedback, tirelessly no matter how often learners get it wrong during the process (Furo, 2015).

Computer as instructional material has made a significant contribution to a wide range of group-learning activities. They can, for example, be used to manage or structure a group-learning process, by guiding the group through a simulation exercise of some sort (Gambari & Yusuf, 2017). This can provide a vehicle through or with which a group of learners interact, and gain access to information, investigate simulated situation, which can lead to creativity indeed, virtual all these are ways in which computers can be used to determine pupils interest in learning. It can also be used in group-learning situations. Learners in groups thus, do not only benefit from feedback they receive from the computer, but also from the feedback they receive from one another (Nwafor & Okoi, 2016).

Attitude as a concept is concerned with an individual's way of acting and behaving. It has very serious implications for the learner, the teacher, the immediate social group with which the individual learner relates and the school system. Attitudes are formed as a results of some kind of learner experiences. They may also be learned simply by following the examples, opinions of parents, teachers or friends. This is imitation which also has a part to play in the teaching and learning situation. In this respect the learner draws on his teacher's deposition to form his own attitude which may likely affect his learning outcomes (Eriba, 2013). Negative attitude can lead to low expectations on students 'academics. Also teaching strategies can influence the attitude of students positively or negatively. Reports have shown that improved instructional strategy affects the attitude of students. Gambari and Yusuf (2017) reported that students taught using cooperative learning strategy had positive attitude to the educational benefits derived from group work.

The purpose of this study was to examine the effect of Computer-assisted model on upper basic III students' attitude towards drug abuse education Specifically, the study sought to find out:

1. The effect of computer-assisted model on upper basic III students' attitude towards drug abuse education.
2. The effect of computer-assisted model on male and female upper basic III students' attitude towards drug abuse education.

Research Questions

1. What is the mean attitude scores of upper basic III students exposed to computer-assisted model and those exposed to the expository method?
2. What is the mean attitude scores of male and female upper basic III students exposed to computer-assisted model and those exposed to the expository method?

Research Hypotheses

H₀₁: There is no significant difference between in the mean attitude scores of upper basic III students exposed to computer-assisted model and those exposed to the expository method.

H₀₂: There is no significant difference between in the mean attitude scores of male and female upper basic III students exposed to computer-assisted model and those exposed to the expository method.

Methodology

Quasi experimental research design was employed for the study. The sample for study comprised 85 upper basic III students from three intact classes purposively selected from three public co-education schools in West Senatorial Zone, Nasarawa State, Nigeria. The schools were purposively sampled based on equivalence in laboratories, ICT facilities and manpower. The schools were randomly assigned to experimental groups (exposed to Computer-Assisted Model (n = 40), Expository Method (n = 45)).

Attitude Towards Drug Abuse Education Questionnaire (ATDAEQ) was used as instrument for data collection. ATDAEQ contained 20 items designed to determine students' attitude toward drug abuse education, it was rated using a four-point rating scale. The options were; Strongly agreed (SA) = 4 points, Agree (A) = 3 points, Disagree (D) = 2 points and Strongly Disagreed (SD) = 1 point. The reliability of ATDAEQ was determined using Cronbach Alpha and the coefficient obtained was 0.79 implying that the instruments were reliable enough for the study.

Results

Mean gain scores were used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the research hypotheses at 0.05 alpha level of significance.

Research Question One

What is the mean attitude scores of upper basic III students exposed to computer-assisted model and those exposed to the expository method?

The mean gain attitude scores of upper basic III students exposed to computer-assisted model and those exposed to the expository method are presented in Table 1.

Table 1: Mean Attitude Scores of Students Exposed to Computer-Assisted Model and Those Exposed to The Expository Method

Group	Type of Test	No. of Stud.	Mean	Mean Gain
Computer-assisted Model	Pre-attitude	40	25.35	42.86
	Post-attitude	40	68.21	
Expository Method	Pre-attitude	45	23.72	26.71
	Post-attitude	45	50.43	

Table 1 shows that the Computer-assisted model have the highest mean attitude gain scores while Expository Method have the lowest mean attitude gain score.

Research Question Two

What is the mean attitude scores of male and female upper basic III students exposed to computer-assisted model and those exposed to the expository method?

The mean gain attitude scores of male and female upper basic III students exposed to computer-assisted model and those exposed to the expository method are presented in Table 2.

Table 2: Mean Attitude Scores of Male and Female Students Exposed to Computer-Assisted Model and Those Exposed to The Expository Method

Group	Gender	N	Type of Test	Mean	Mean Gain
Computer-Assisted Model	M	21	Pre-attitude test	34.44	32.65
	M	21	Post-attitude test	67.09	
	F	19	Pre-attitude test	32.37	22.07
	F	19	Post-attitude test	54.44	
Expository Method	M	22	Pre-attitude test	22.09	25.58
	M	22	Post-attitude test	47.67	
	F	23	Pre-attitude test	19.11	20.77
	F	23	Post-attitude test	39.88	

Table 2 shows that the male students in both the Computer-Assisted Model and the Expository Method have the highest mean attitude gain scores while the female students in both groups have the lowest mean attitude gain score.

Research Hypothesis One

There is no significant difference between in the mean attitude scores of upper basic III students exposed to computer-assisted model and those exposed to the expository method.

The test of this hypothesis provided the data on Table 3.

Table 3: Result of Analysis of Covariance on Students' Attitude Towards Drug Abuse Education Using ATDAEQ

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Result
Corrected model	4230.331	2	1103.141	43.119	0.000	S
Intercept	11343.312	1	11343.312	321.372	0.001	S
Pre-attitude	39.763	1	39.763	42.342	0.000	S
Group	2016.524	1	2016.524	97.101	0.000	S
Error	4601.921	80				
Total	22231.851	85				

Significant at P<0.05

Table 3 shows a significant difference in the attitude of upper basic III students towards drug abuse education, F= ratio of 97.101, P<0.05. The result implies that the instructional methods produced significant effects on the post attitude scores of students when covariate effect (pre-attitude) was controlled. The null hypothesis of no significant difference was therefore rejected indicating that there is significant difference.

Research Hypothesis Two

There is no significant difference between in the mean attitude scores of male and female upper basic III students exposed to computer-assisted model and those exposed to the expository method.

The test of this hypothesis provided the data on Table 4.

Table 4: Result of Analysis of Covariance on Male and Female Students' Attitude Towards Drug Abuse Education Using ATDAEQ

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Result
Corrected model	2161.081	2	1103.141	510.75	0.000	S
Intercept	10525.314	1	11343.312	401.509	0.001	S
Pre-attitude	131.801	1	39.763	42.342	0.003	S
Group	1701.070	1	2016.524	49.180	0.000	S
Gender	127.310	1	127.310	86.079	0.001	S
Error	30215.021	79				
Total	44861.597	85				

Significant at P<0.05

Table 4 shows a significant difference in the attitude of male and female upper basic III students towards drug abuse education, F= ratio of 86.079, P<0.05. The result implies that the instructional methods produced significant effects on the post attitude scores of

students when covariate effect (pre-attitude) was controlled. The null hypothesis of no significant difference was therefore rejected indicating that there is significant difference.

Discussion

The findings of this study revealed that the use of Computer-assisted model had significant effect on students' attitude toward drug abuse education. Students exposed to computer-assisted model had a higher mean attitude gain scores than those exposed to Expository method. This result is in agreement with the findings of Gambari and Yusuf (2017); Nwafor and Okoi (2016); Furo (2015); who found out in their different studies that Computer-assisted model have positive effect on students' attitude in Science Education.

The findings of this study suggest that exposing Basic students at the upper level to computer supported learning model could improve attitude towards drug abuse education. This should be given strong emphasis in the teaching of at upper basic schools in Nigeria.

Conclusion

The findings of this study revealed significant differences in the attitude of upper basic III students towards drug abuse education.

Recommendations

1. Basic Science teachers should be encouraged to adopt computer-assisted model so as to improve students' attitude towards drug abuse education.
2. Government should provide adequate materials, enabling environment and appropriate training of upper basic teachers through seminars, workshops and conferences.

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Comparative Analysis of 'Beloved' and 'God help the Child' by Toni Morrison

Myra Ikram

M.Phil. (English Literature), Department of English,
Government College Women University, Faisalabad,
Pakistan.

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Abstract- Toni Morrison is an influential African American writer who writes about contemporary literature. Most of her work revolves around slavery, its aftermath, and racial segregation, motherhood, suffering women and confined in her vivid flashbacks of the horrors a past may contain. The present research work undertakes an analysis of the representation of the elements of motherhood and racism with respect to the feminism in Morrison's *Beloved* (1987) and *God Help the Child* (2015) by drawing attention to the characters' past experiences of distress and anguish and their weight upon the present. Qualitative approach has been employed in the study and content analysis is done as part of data analysis to explore the particulars of characters depicting motherhood and racism. Findings indicated that both the novels are filled with specific attributes of motherhood, racism and feministic features that have been displayed and manifested through the characters of the novels. It was concluded that discrimination on the basis of gender, racial segregation leading to massacres have been the subject matter of Morrison in both the novels.

Index Terms- Slavery, Motherhood, Racial Segregation, Women Suffering.

I INTROUCTION

Toni Morrison, an African American fiction writer of the post-modern era and one of the best post World War II novelists, owns a strong command over flashbacks, and holds her entitlement to the past life of her characters with such a confidence that not only gives her an authoritative certainty, but also spills a realist feature in each of her character's present lives, as they try to compose themselves from their destructive past.

Most of her work revolves around slavery, its aftermath, and racial segregation, motherhood, suffering women and confined in her vivid flashbacks of the horrors a past may contain (Singh, 2016).

Slavery and Racism have been the highlight of non-political world affairs for centuries, breaking from which, the Africans somewhat owe to Martin Luther King's efforts and mesmerizing speech "*I have a Dream*", making the dark-skinned people realize that their skin color does not define their fate as doomed to be slaves forever. Racism is extreme hatred or condescence towards someone just because of them being different. Likewise, the inferior treatment and the scorn of whites towards the blacks over the centuries has been a major subject of Toni Morrison's writings, however, without servitude and with an utmost freedom.

Being an African American herself, having a lavishly oriental dark skin, Morrison wears her identity with pride and owns it truly to the core. She serves as the omniscient narrator who has seen the horrors of slavery and racial segregation. In most oriental writings, we trace racism and imperialism against the blacks by the white skinned people. However, with utmost realism, Morrison turns the tables when she brings her audience face to face with the insecurities of the black household itself, having faced generations of slavery, inferiority complexes and racism. Thus, the racism seems to be 'internalized' or common-sensified (Bacon, 1620).

Her Pulitzer Prize winner novel *Beloved* (1987) and another milestone of hers *God Help the Child* (2015) are two comparable post-modern novels which reflect the struggles of motherhood confined within the boundaries of racial segregation. Therefore, a reader finds traces of maternal misery in being unable to save their children from the horrors they themselves have faced. *Beloved* is a depiction of such helpless woman who was left with the only option of killing her children to save them from the life-long misery of servitude. In stark contrast stands the motherhood of *God Help the Child*, the story of a twenty-three-year-old black lady Lula Ann Bridewell who suffers from rejection throughout her childhood because she's born midnight-black to a fair-skinned pair of parents (Zayed and Maseeh, 2016).

Her themes seem to be repeating in different works as well. She constantly draws comparable imagery with similar situations, marked by some contrasting features. However, the peculiarity lies in the fact that even though racial segregation and colorism shouldn't be sexist, the maternal share of suffering seems to be much more than the paternal while dealing with the horrors of racism, as is the case with both novels, where one father is invisible and the other abandons family due to a midnight-black born daughter.

The researcher aims to highlight Morrison's elements of African Feminism in the two novels through portrayal of suffering women who gradually attain peace. African Feminism differs by degrees from the mainstream Western Feminism, as it doesn't

oppose, it only builds on women rights, unlike the Western feminism that combats oppression of women by attacking the male counterparts.

In Morrison's novels, a reader can trace how her protagonists' fights against their miserable conditions, rather than fighting against their male counterparts, while beautifully managing the traditional gender roles entitled to them by the African norms of society.

Background of the Research

Feminism arises from gender discrimination in the form of oppression and suffering of women and combats against sexist attitudes which have been prevalent throughout the history. This research focuses primarily on the heart-wrenching racism and prejudice against the black Africans not only by the White people but also by their own race that has accepted the reality of their supposed inferiority, while the main sympathy of the researcher remains with the black women who bravely combat both racial and sexist segregation and come out victorious as the protagonists of both the novels.

Statement of the Problem

History has witnessed an evolution of suppression and torture of women, from the primitive physical danger to the modern psychological damage caused by the society in general. The researcher has narrowed down this feministic study to black women who, once miserable against slavery, start combating against it at one point. Thus, focus is not only on racist attitudes of society towards dark skin, but also the psychological damage that this racism can cause, as portrayed in both the novels *Beloved* and *God Help the Child*.

Delimitation

This study is limited to find out the elements of racism and motherhood from a feminist perspective, in Toni Morris's two novels *Beloved* and *God Help the Child*. Former was published in 1987 and latter was published in 2015.

Objectives

- To find out the elements of racism in characters of *Beloved* and *God Help the Child*
- To explore the elements of motherhood in characters of *Beloved* and *God Help the Child*

Research Questions

- What are the elements of racism portrayed in characters of *Beloved* and *God Help the Child*
- What are the elements of motherhood depicted through the characters of *Beloved* and *God Help the Child*

Significance of Study

The research will be beneficial for further researchers in understanding how women may suffer from abandonment and psychological damage for the choices they didn't make. This will enable future researchers to understand how gender disparity still exists in the form of gender roles or attributes, often leading to psychological abuse and torture. Hence, they may raise their voices against the correct epidemic in the future.

II. LITERATURE REVIEW

Critics Views on God Help the Child and Beloved regarding Feministic Approach and Racism

Many critics talk about the distinctive branch of feminism found in Morris's novels, i.e.: the African Feminism that holds intricately the load of cultural values while claiming an identity of its own.

Badejo (1998) asserts that:

“African feminism embraces beauty, power, serenity, inner harmony, and a complex matrix of power. It is always poised and centered (sic) in womanness. It demonstrates that power and femininity are intertwined rather than antithetical.”

Itang Ekpe Amissine maintains about African Feminism:

“The distinction between African Feminism and Western Feminism by some scholars is the fact that African Feminism underlines the notion or motherhood and is not ‘anti-men’, as opposed to Western Feminism, which rebels against any form of gender inequality, irrespective of cultures and traditions. In traditional Africa, women were considered to be docile and existed as mere exotic accessories to men.”

These definitions of the African Feminism are visible in both the novels *Beloved* and *God Help the Child* where we see suffering of women and combating against it but no sign of revolt against the more privileged gender, conforming to the more acceptable remnants of traditional norms of African society. The concept of motherhood has been badly devastated in both the novels.

Beloved shows the devastation of motherhood to a higher degree, owing to slavery. The relationship of Sethe with her mother and her own children explain by degrees how women had to abandon their kids as objects unto the masters, an obligatory act which now sends shivers down the spine of independent and free mothers (Singh, 2016).

As Beaver (2012) observed in her analysis of the *Beloved* in:

“Morrison explores the fact that slave mothers often were not allowed to raise or nurse their own children, and shows the damage it does to the mother-child relationships. Slavery turned children of slaves into property—property that was not the slaves,’ but the masters;’ mothers could not nurse or raise their own children: a provision to ensure they would not become attached to them; and the horrors of slavery caused emotional disconnects that led to mothers mentally neglecting their children.”

However, in *God Help the Child*, motherhood takes a different turn and is not entirely devastated by slavery, but shows remnants of internalized colorism disguised by “concern for a colored child” (Ramtani, 2017).

As Sweetness’s self-defense is:

“Some of you probably think it’s a bad thing to group ourselves according to skin color – the lighter, the better – in social clubs, neighborhoods, churches, sororities, even colored schools. But how else can we hold on to a little dignity?”

Here, her entire claim of ‘mistreating Bride for the sake of hardening her heart against the harsh society’ and ‘preparing her for the World’ seems to be shaking, as the above lines tell us that she takes pride and hides her dignity in her light skin, rather than her maternal concerns.

Gay (2015) has traced out the notion as:

“While Sweetness will apologize for her child’s dark skin, what she will not apologize for is how she sees the world and how she raises her child. If colorism is what allowed black folk to hold on to their dignity, Bride was never going to be allowed any. With a mother who disdains her very existence, it comes as no surprise when Bride tells a lie that sends an innocent woman to prison just so her mother might see her, claim her, and love her – so she might have some dignity of her own.”

English Writers on Feminism

Feminism evolved from a societal need to reform the status of women. Many books and literary pieces have thence been dedicated to the topic.

Charlotte Bronte’s (1847) *Jane Eyre* is the prototype of a feminist, paving way to the idea of female status and individuality, as the protagonist breaks away from the conventional norms and travels alone far and wide, leading a spiritual journey, attaining the status of “Bildungsroman” for a woman for the first time. Moreover, the protagonist chooses to love on her own terms rather than being dictated by a man.

Thomas Hardy’s (1891) *Tess of the d’Urbervilles* is an antithesis of feminism, which is clinging frantically to conventional norms and designs a character whose ultimate hamartia is her servitude and selflessness. Suffering will find its way to Hardy’s Tess eventually, which in his view is humanly possible, whereas the 21st century feminist sees it as a disgusting and exaggerated portrayal of a mute woman without a claim on human rights.

Emily Bronte’s (1847) *Wuthering Heights* also manifests in the characters of Catherine and Isabella some defiance against the male hierarchy.

Elizabeth Bennet from Jane Austen’s (1813) *Pride and Prejudice* is the complete feminist embodiment in contrast to the other women of the novel. She’s highly intellectual, skeptical, opinionated, well-read, genuine, independent, authoritative and sensible.

The Second Sex by Simon De Beauvoir (1949) reveals the brutal treatment of women throughout history, attributing it to cultural manipulation of women into characters that are supposed to surrender rather than revolt.

Pakistani writers on Feminism

Kamila Shamsi’s (2005) *Broken Verses* portrays women as multi-dimensional and well-rounded characters, finding loopholes in relationships and making peace with it.

A very well-known novel *My Feudal Lord* by Tehmina Durrani (1991) points out the societal flaw of creating chauvinistic hierarchy in society, as the male character Mustafa Khar is molded into a chauvinist by societal privileges. There are many occurrences in the story which display that the source of women's suppression and men's domination lies in social discrimination.

Durrani's (1998) *Blasphemy* is another novel that depicts without fear the violation of women rights in a male dominant society. There are more contemporary writers who touch the topic with brevity or detail, and women rights' activists are merging into quality writers highlighting the vices women have to face in this male hierarchy which exploits and misuses its power against women.

English Writers on Racism

Harper Lee's (1960) *To Kill a Mocking Bird* depicts the horrible fate of the black people in America at the time, where a Negro is accused of raping a white girl and despite being proved to be innocent is jailed and commits suicide, whereas Atticus Finch the white lawyer puts everything at stake to proclaim justice but to no avail.

Things Fall Apart by Chinua Achebe (1958) takes the reader to a journey of pre-colonial life of Nigeria which gets destroyed by the advent of The English colonizers.

Joseph Conrad's (1899) *Heart of Darkness* exclaims 'savages' all over it, a term used for the black people of Africa. The hostility with which they are treated and slaved and murdered during history seems to be evident in the book.

Burmese Days by George Orwell (1934) depicts the British hierarchy in Burma during their British rule i.e. Colonization.

Jean Rhys (1966) wrote her *Wide Sargasso Sea* in 1966 which is a post-colonial commentary on racism also benefitted by feminist exploration of power struggle between men and women, written as a prequel to Bronte's *Jane Eyre*.

Pakistani Writers on Racism

Not many contemporary writers have contributed to this genre owing to the post-colonial legacies of Western superiority embedded in our mindsets. However, we do see some potential writers in the Urdu language describing the horrors of war of independence and the separation of East Pakistan and West Pakistan, thus covering the brutalities rooting from religious discrimination (1947) and racial discrimination of Bengalis and non-Bengalis (1971).

III. RESEARCH METHODOLOGY

Research Paradigm

Qualitative research paradigm has been applied since the research is literary. The primary source of the data collection of this research is Toni Morrison's two novels, *God Help the Child* and *Beloved*. The books are related to harsh realities of slavery and racism, and their aftermath on the destroyed family lives. We also trace feminism in the novels as the protagonists are females who go through traumatic conditions due to racism and societal narrow mindedness.

Sample

Toni Morrison's two novels '*Beloved*' and '*God Help the Child*' have been taken as sample texts to shed light on racism and feminism. It was a Systematic Sampling technique because novels were chosen in their chronological order written twenty-eight years apart; *Beloved* being the first written by the writer in 1987 and *God Help the Child* is the latest, published in 2015.

The novels portray the psychological trauma of black women based on their racial and color differences from the whites.

Data Collection

Data of this research is Toni Morrison's two novels, *God Help the Child* and *Beloved*. The books are related to harsh realities of slavery and racism, and their aftermath on the destroyed family lives. We also trace feminism in the novels as the protagonists are females who go through traumatic conditions due to racism and societal narrow mindedness.

Instrument

The researcher itself is the instrument of the research as the researcher employed the observation techniques to explore the elements of motherhood and racism in the novels.

Method of Data Analysis

Content analysis was used as the procedure of data analysis for the research. The two novels were thoroughly studied and the constituents of motherhood and racism were scrutinized from the two novels.

IV. CONTENT ANALYSIS

Feminism and Motherhood

Through Sethe's Character (Beloved)

Mocking the British spirit of 'civilizing mission' is Morrison's strong female protagonist Sethe, who displays in her character a sense of awareness and a far-sightedness embedded in the agony of a mother, unlike the 'savages' the British claim the Africans to be.

She is well-aware of the fate of her children as slaves, as she herself has suffered all her life from the horrors of slavery. It is important to note that slavery has not corrupted her sense of duty and motherhood.

As Paul D. thinks,

"For a used-to-be-slave woman to love anything that much was dangerous, especially if it was her children she had settled on to love."

What is later revealed through flashbacks is the event of Sethe's escape from the happy home, which to no avail leads to a recapturing of Sethe and her kids by the former master as was the custom back in the 19th century. As Sethe runs away from fear of getting caught again, she takes a motherly decision. Against all the softness of a mother's glance, she kills her two-year old daughter with an axe to save her from the future fate of slavery.

Despite her love for her children, her killing of her own child reveals the traumatic state of motherhood found in the black women of the time-period. As she says, "I wouldn't draw breath without my children."

Amidst the chaos, like any other parent of any other race, she wants a better life for her children than what she herself has endured.

As Sethe thought,

"O Lord, deliver me. Unless carefree, motherlove was a killer."

Through Denver's character (Beloved)

The little girl Denver who was the symbol of innocence in the novel later becomes skeptical of Beloved's presence and takes a stand to get rid of the problem. In addition to her mother's strength and courage, Denver possesses the resolution of a feminist and fights against her problems to save her family life and earn a living, without depending on any male figure. The end of the novel suggests that she was victorious in her triumphant attempts.

Through Sweetness's character (God Help the Child)

The character of Sweetness, a fair-skinned African mother, has a very superficial portrayal of motherhood in God Help the Child as compared to Sethe's selfless love in Beloved.

As she gives birth to a dark child, she loathes the child as if it would contaminate her skin. As she says about her own daughter, "So black she scared me," Moreover, she finds something "witchy" about her child's eyes, and never lets her child address her with a word showing motherhood like 'mama', instead she requires Lula Ann to call her 'Sweetness'.

Having ruined Lula Ann's childhood, Sweetness still refuses to take any blames even by the end of the novel, "I know I did the best for her under the circumstances,"

Through Lula Ann Bride's character (God Help the Child)

Despite a traumatic childhood, Bride's struggle and achievement in society shows an utmost resolution and a sense of selfhood characteristic to feminism. She refuses to surrender to the society and so the society accepts her the way she is. She also refuses to accept the abandonment by her boyfriend Booker, unlike her mother's surrender to her husband's decisions. She goes in search of Booker and what is achieved out of this resolute refusal of accepting fate is a beautiful life ahead with Booker and their child, something which her mother could not achieve. Morrison thus highlights the feministic attitude in Bride in contrast to Sweetness's fatalistic viewpoint.

Moreover, Morrison proceeds to compare the motherhood of Sweetness with that of Bride's.

"A child. New life. Immune to evil or illness, protected from kidnap, beatings, rape, racism, insult, hurt, self-loathing, abandonment. Error-free. All goodness. Minus wrath. So they believe."

Through Louis's character (God Help the Child)

One can evidently see in Louis's abandonment of Sweetness, for producing a black child, a juxtaposition of both racism and women suffering. He can't bring himself to believe that the child is black so he leaves his wife and daughter, declaring her to be illegitimate. Such is the power of a man. On the other hand, Sweetness delves in misery without confronting Louis depicting the African Feministic traditions.

Racism and Slavery

Through Baby Suggs character (Beloved)

In the book *Beloved* written in 1987, and set up in 1873 after the civil war, some major signs of racism occur portrayed through the characters.

The character of Baby Suggs reveals at various points how she and everyone she knew were treated as commodities. Everyone she loved was sold, sent away or killed. Her narratives and vague memories of her childhood and of giving births are ghostly nightmares creeping under your skin at midnight.

"Yonder they do not love your flesh. They despise it...And O my people they do not love your hands. Those they only use, tie, bind, chop off and leave empty," Baby Suggs said.

Through Sethe's character (Beloved)

The protagonist of the novel *Sethe* is a living example of how horrifying slavery can be to mankind. Her strong character involves escaping from slavery of sweet home along with her children, without a male counterpart as her husband never makes it to Cincinnati, Ohio.

Her self-awareness is ironic, as the British claimed superiority over the blacks of all kinds, like intellectual ability to decipher rationality or reason. The racism thus proves to be baseless when Morrison presents to us a rationally-thinking slave mother of African descent in the 19th century.

We can also see her misery and her haunted life based on the one act of hastily judgment which was an outcome of the racism she faced.

Through Paul D.'s character (Beloved)

Paul D. is the most prominent male figure of the novel and a supporting figure for the protagonist *Sethe*. Being an escapee from the Sweet Home himself, Paul D. has faced the same racism and discrimination and has seen horrible events of racism against Negroes.

"During, before, and after the war [Paul D] had seen Negroes so stunned, or hungry, or tired or bereft it was a wonder they recalled or said anything."

Revealing to the audience his personal experience of deep-rooted racism, Paul D. says:

"Mister was allowed to be and stay what he was. But I wasn't allowed to be and stay what I was."

In the latest novel *God Help the Child* (2015), the researcher has found several elements of Racism and internalized racism as well.

Through Sweetness's character (God Help the Child)

The character befitting the mother of the protagonist who calls herself Sweetness shows elements of both prevalent racism and women suffering. Being fair in complexion, she has attained this 'superiority' over the other people from her black race, and has allowed this superiority to creep in her skin as a validation of her existence.

Her harsh treatment of her black daughter through the innocent years of budding and prime youth show that her mind is still tangled in the extreme colorism America has seen, and she possesses an extreme level of internalized racism, which is provable because Sweetness disguises her harsh treatment of *Bride* as 'preparing for the World'.

However, the hard-earned successful adult life of *Bride* shows that Sweetness had mere apprehension and paranoia and she should have strengthened her daughter for accepting her reality rather than feeling inferior for her color. It is interesting to note that Sweetness's inability to understand child psychology is contrasting to *Sethe's* extreme care for her children. The more Sweetness attains the 'whiteness', the more she loses her sense of self.

Through character of Lula Ann Bride

Bride, the black child born to fair skinned parents, is a miserable creature doing all sorts of things to acquire her mother's love, to which she was entitled by birth. Her career shows that she wasn't oppressed much by the society but abandoned by her own parents who lost their dignity by producing a black progeny. Thus, colorism spills the black and white pages of the novel.

V. FINDINGS

The above research and collection of data shows that both the novels are filled with proofs of racism and feministic features, while the reader sees a contrasting depiction of motherhood in *Sethe* and *Sweetness*.

Psychological damages of Slavery and racism

It is quite evident that slavery leads *Sethe* to a point that she kills her own child, the psychological damage of which is never compensated for. She's haunted by it all her life until she loses her mind and goes mad. Similarly, *Bride's* mother antagonizing her for the black skin leads to a traumatic childhood where the child loses all sense of morality and testifies against a white woman and sends the innocent woman to jail just for pleasing her mother. The age that demands psychological upbringing and induction of morality gets plagued by racism.

Abandonment of women as mere objects

This is a recurrent theme of the novels. In *Beloved*, *Sethe* is abandoned by Paul D. for her past mistakes, committed in a state of trauma. In *God Help the Child*, *Sweetness* is abandoned by her husband Louis just because their daughter is naturally black. *Bride* is abandoned by her boyfriend Booker in innocence for trying to right her wrongs.

All these men seem to be authoritative and selfish and do not consider the feelings of their counterparts. They treat the women as mere objects without feelings.

Corruption of motherhood due to Colorism

Colorism and racial segregation causes *Sethe* to become a murderess that would otherwise have lived a happy life with her children and *Baby Suggs*, in *Beloved*. In the modern text of *God Help the Child*, *Sweetness's* motherhood is corrupted by being born fair to an extent that she withdraws maternal connection with her black child and prefers to be called *Sweetness* rather than 'mom'.

VI. CONCLUDING REMARKS

Violent reactions to differences has always been a part of mankind, may they be racial, religious or ideological differences. Racial segregation however earns the prize as it's one of the largest events of human history, leading to massacres and slaughter. In a world where tolerance is evaporating and differential negotiation is fading, the pattern of racism has a trail in history. Many writers raise their voices against the discrimination. i.e.: gender discrimination as depicted by feminist writers and racial injustice by the conscious and aware writers, may they belong to the oppressed or the oppressor community. Such is the voice of Toni Morrison. Detailed analysis of the books revealed that black women were not allowed the basic courtesy of raising their child as the child becomes a slave instantly at birth and is the property of the master.

Her writing depicts a panoramic vision of the issues discussed in the research and she holds a command over the language to produce her perfect ingredient soup of the two books, all in the right amount, without any harsh remarks towards the culprits. She elevates the spirit of being African by a sense of forgiveness to the oppressor, but being conscious and aware of the injustice of segregation, portrays her vision with a strong and undisguised realism. This creation of a magical realism effects on the reader without being offensive.

VII. FUTURE RECOMMENDATION

Toni Morrison's novels *Beloved* and *God Help the Child* can be viewed as powerful depictions of slavery traditions, racial segregation and African Feminism. These books can be recommended for a study of racism and female suppression to further researchers especially in analyzing different scenarios of motherhood. Her writing can influence future generations and can be used to raise voice against discrimination. People from any nation can utilize *Bride's* story to understand the vile and damage of colorism, as is also prevalent in Pakistani society, another colonial legacy of 'white beauty'.

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AUTHOR

AUTHOR- Myra Ikram, Department of English, Government College Women University, Faisalabad. Pakistan.
myra.haque@gmail.com

Geospatial Analysis of Encroachments on the Nigeria Electricity Grid Right-of-way in Parts of Port Harcourt, Nigeria

Eze Promise I, Richard J.U.

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Abstract- This study is to geospatially analyze and assess the rate of encroachment on the Nigeria Electricity Transmission Grid Right of Way (ROW) in parts of Port Harcourt, Rivers State of Nigeria. This research work was done using ground truth survey and remote sensing technique. Coordinates of the electricity power line pylons were obtained from the office of the surveyor general, Rivers State Ministry of Lands and Survey, the coordinates were used to geo-reference the spot satellite images of the year 2007, 2012 and 2017 respectively using ArcGIS 10.1. The spot images were used for spatiotemporal changes in the study area. Buffer of 50m ROW was created and buildings within ROW were digitized to ascertain the rate of encroachment on the Electricity Power Line Right-of-Way. The total Length and Area of ROW under study was 5.68km and 558,381.804sq.meters respectively. The research findings and results shows that a total built-up area of 21,330.184sq.m, 75,660.733sq.m and 111117.979sq.m were encroached in the year 2007, 2012 and 2017 respectively for buffer of 50meters with a percentage encroachment of 3.82%, 13.55, and 19.90%. The ground truth survey also shows that there is persistence building encroachment and business activities on the Electricity Transmission Power line ROW of the study area. Immediate removal of structures on the ROW was recommended and further study should be carried out to monitor further encroachments and forestall destructions of life and property of residence within ROW.

Index Terms- Buffer, Encroachment, Geo-spatial, Pylon.

I. INTRODUCTION

The Nigeria Electricity Power Transmission Grid is an integral part of the electricity value chain. The operation of the electricity transmission network is vested in the Transmission Company of Nigerian (TCN), one of the companies unbundled from the Power Holding Company of Nigeria Ltd. (Odion, 2016). The National Power Transmission Grid line composed of 132kv and 330kv lines respectively across the country. TCN has continuously cautioned and alert the public on the dangers of erecting buildings and conducting business on the Electricity Transmission Line Right of Way (ROW) across the country. The continuous building and erecting of structures on the electricity grid ROW by land developers who are ignorant of the dangers is highly alarming and of serious concern to the Government.

The National Electrical Code (NEC) mandates 50m acceptable clearances for power lines to keep the public safe and prevent contact with electrical currents. According to the Nigerian electricity news online, government must act now in ensuring safety of life and property by protecting utilities ROW across the states of the nation. The just concluded National Power Safety Summit held on the 21st of November, 2017 at Uyo, Akwa Ibom State Capital, Nigeria revealed that over 445 deaths were recording in the sector between 2014 and 2017. The Summit also revealed within the same period under review that over 289 persons sustained various degrees of injuries across some state of the nation. Table 1:1 below shows the recommended and acceptable ROW or required setback of respective power lines.

Table 2:1 Recommended and acceptable ROW

S/N	VOLTAGE	TYPE OF POWER LINE	HEIGHT OF POWER LINE	RECOMMENDED ROW
1.	0 – 150 volts	Low tension	10 meters	3 meters (Horizontal)
2.	300 – 600 volts	High tension sub transmission line	12 meters	4 meters (Horizontal)
3.	11KV	High Tension (Commercial areas)	15 m	12.5 meters (Horizontal)
4.	33 KV	Power High Tension Transmission line	15m	12.5meters (Horizontal)
5.	132 KV	National Grid	30m	50meters (Horizontal)
6.	330KV	National grid	30meters	50meters (Horizontal)

Source: The Nation Newspaper May, 2016.

II. NIGERIA ELECTRICITY NEW ONLINE

Many land developers are ignorant of the stipulated ROW on the National Grid as recommend by the National Electric Code (NEC) and electric power sector reform act, No 6, of 2005 of Nigeria.

(Udia, 2014) noted that those public infrastructures that are usually involved in ROW acquisition may traverse many states, this usually involve large scale land acquisition. Examples of these public infrastructure that required ROW include:

1. Road and highway network infrastructure, including bridges, culverts, side walk etc
2. Electricity infrastructure including the national grid, other transmission lines, power stations, street lights etc
3. Gas/oil pipeline, including the storage and distribution terminals as well as distribution network.
4. Water infrastructure including the system of pipes used in the collection and disposal of water, drainage system, sewage collection and disposal of water, drainage system.
5. Telephone/ telecommunication mask including telegraph lines.

(Timothy, 2017) noted that Overhead electricity transmission power lines are subject to strict guidelines for height clearance (Right of Way) over streets, sidewalks, alleys, drive ways and other traffic areas. A Right Of Way (ROW) is a term used to describe the legal right, established by usage or grant, to pass along a specific route through grounds or property belonging to another, it is also a type of easement granted or reserved over the land for transportation purposes; this can be for highway, public footpath, rail transport, canal, electrical transmission lines, oil and gas pipelines, etc.

2.1 Area of Study

The area of study is a section of the Nigeria Electricity Power Transmission Line ROW in Port Harcourt. The ROW under study stretches from Rumuagholu - Rukpokwu towns of Port Harcourt, Rivers State of Nigeria. It is situated on projected coordinates of 538707.45mN – 541977.39mN and 272939.52mE – 279196.93mE in WGS-84, UTM Zone 32N coordinate system. As shown in figure 1.0, the total distance of the right-of-way under study is 5.68km; The ROW is undergoing massive illegal development and business activities in all directions which prompted the study. This study is targeted at determining the rate of development within the national grid right-of-way in the study area.

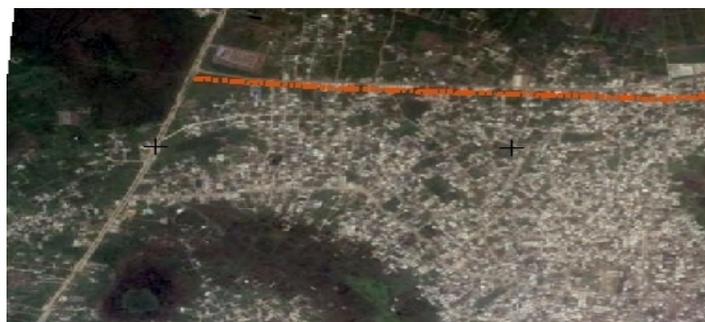


Figure 2.1 Study Area Map Showing spot Image and Electricity Grid ROW

2.2 Statement of Research Problem

Rapid urban development and increasing land use changes due to increasing population and economic growth is being witnessed in Port Harcourt and much of this growth is unplanned and unregulated (Udia, 2014). Presently, there is increase urban expansion, development and business activities along the electricity grid lines in parts of Port Harcourt. Many structures are erected almost at the centre of the Power Transmission grid lines. Erecting building and conducting business under the high tension power lines constitute dangers that could have fatal consequences



Figure 2.2 Building and Business activities on the Electricity Transmission Grid ROW in Rukpokwu axis of Port Harcourt.

2.3 Aim and Objectives of the Study.

The aim of the study is to geospatially assess and analyze the rate of encroachments along the Nigeria Electricity Grid ROW in parts of Rivers State using ground truth surveys and remote sensing technique.

2.4 Objective of Study

1. To create 50m buffer ROW and overlay it on the images of 2007, 2012, and 2017.
2. To digitize the buildings within ROW
3. To determine the rate and percentage of encroachment for respective years

III. RESEARCH METHOD

Planning +

Ground truthing, Geo-referencing

Data processing: Buffer analysis, Digitizing of built-up areas within 50m buffer zone.

Data sets: SPOT satellite images of 2007, 2012 and 2017 with spatial resolution of 2.5m x 2.5m. SPOT satellite image was chosen because of its high resolution content.

Instrumentation: Garmin 76CSx GPS receiver, 50m standardized steel tape, field book, etc.

Software/hardware: Hp Laptop computer with processor Intel® Core (TM2) Duo CPU P9700, 4.00GB RAM, and 64-bit operating system. ESRI's ArcGIS 10.3 (Arbi and Florjan, 2014) – vector based GIS software. The choice of ArcGIS 10.1 was based on its ability to support vector analysis.

3.1 Data Processing

3.2 Buffer Analysis

Buffering analysis is a spatial analysis operation found in ArcGIS. It is used to create specific distance around a feature, and region called buffer zone. Buffer analysis can be used in locating slums from the city centre and for determining impact of air pollution over a given distance (Olaleye, 2017). In assessing the level of encroachment of the Electricity Transmission ROW, buffer of 50m was created. Buffer analysis was performed from

the Analyst Tools in ArcGIS 10.3 software. Proximity was clicked in the 3D Analyst Tools, and buffer was double click. The feature (electricity grid) was clicked; file name and buffer distance (50m) was clicked as output. Finally Ok was clicked to generate buffer zone at specified distance.

3.3 Digitization of Built-up Areas

Image digitization is the process of converting geographical data into vector data. The built-up areas within ROW were vectorized using line and point features (Ghilani and Wolf, 2008). The area of each buildings, rate and percentage encroachment for each epoch were determined (ghilani and wolf, 2008).

IV. RESULTS AND FINDINGS

V.

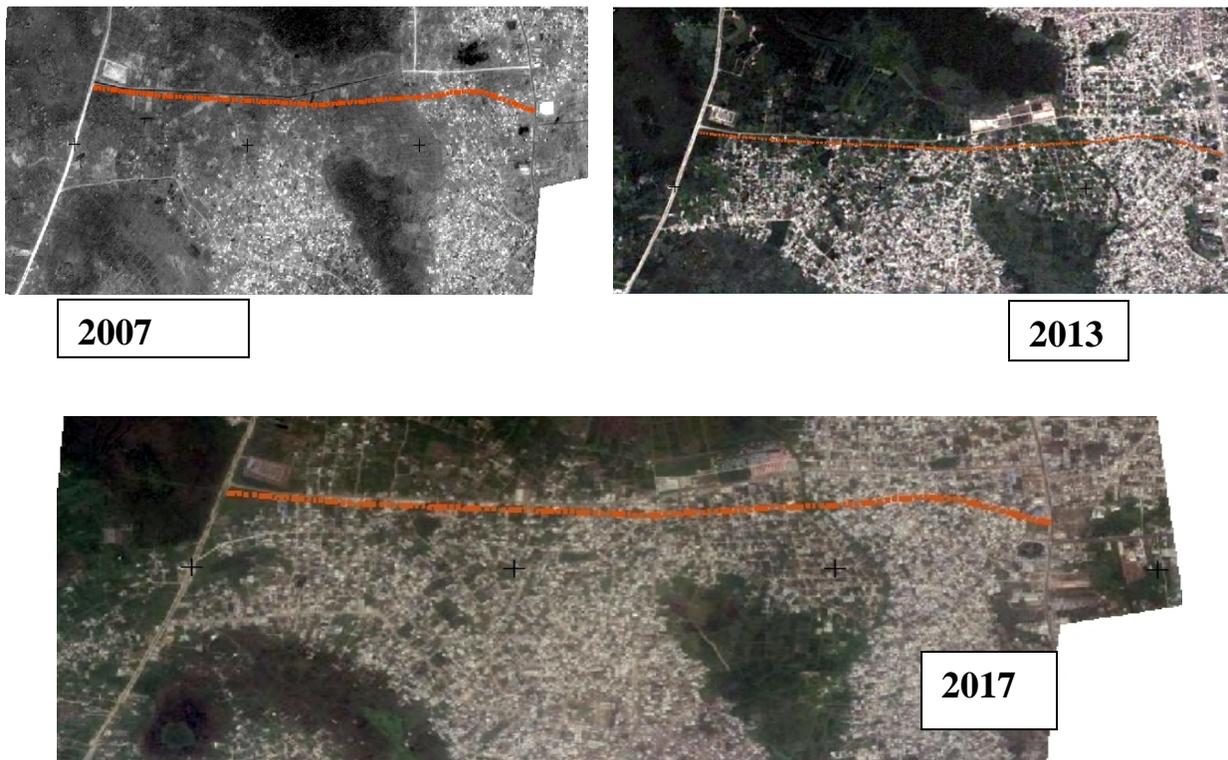


Figure 4.0 Overlay of 50m ROW in (red line) on Spot images of 2007, 2012 and 2017



Figure 4.1 Overlay of a section of 50m ROW on spot image of 2017.



Figure 4.2 Section of digitized buildings on 50m buffer ROW.

Table 4.3: Percentage Encroachment of ROW by built-up computed in square meters for 50m buffer

YEAR	AREA OF 50M BUFFER ROW (Sq.m)	TOTAL BUILT-UP AREA ENCROACHED PER YEAR	PERCENTAGE ENCROACHMENT
2007	558,381.804	21330.184Sq.m	3.82%
2012	558381.804	75660.733Sq.m	13.55%
2017	558381.804	111117.979Sq.m	19.90%
Area not encroached		350272.905.Sq.m	62.73%
Total Percentage			100%

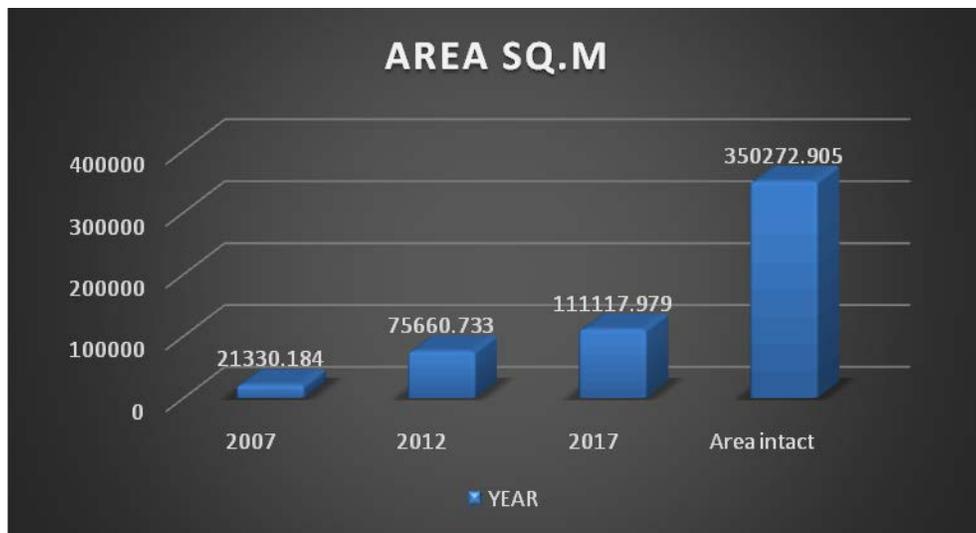


Figure 4.3 Bar chart showing level of built-up encroachment of 50m buffer ROW.

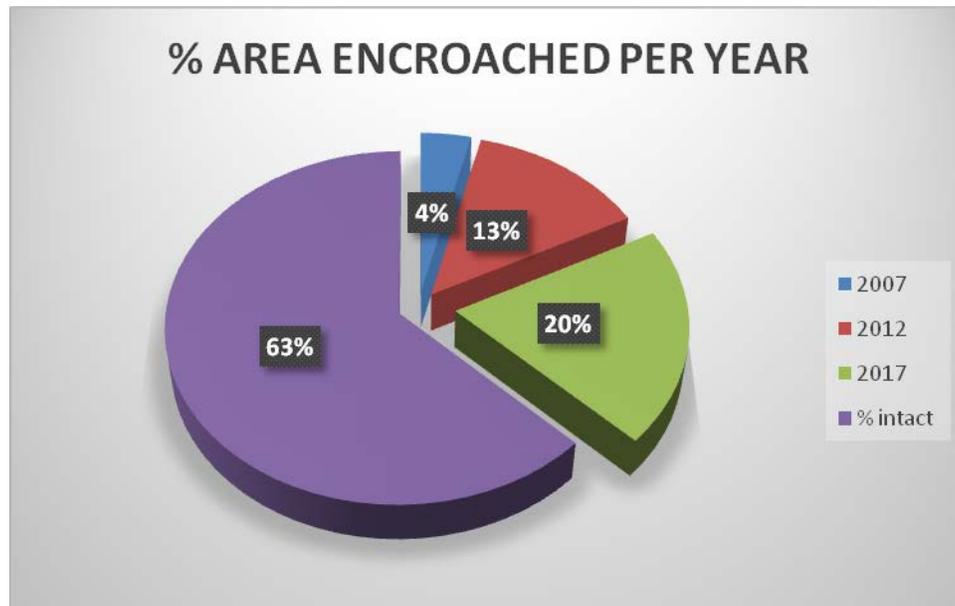


Figure 4.4 Pie chart showing Percentage Area Encroached on 50m buffer ROW.

VI. RESEARCH FINDINGS

The result presented above has proved the justification and necessity of this research work. The rate and speed of building encroachment is relatively high. The total area of ROW under study for 50m buffer is 558,381.804sq.m. The research findings from the results above shows that a total area 21,330.184sq.m, 75,660.733sq.m and 111117.979sq.m where encroached in the year 2007, 2012 and 2017 respectively with a percentage encroachment of 3.82%, 13.55, and 19.90% for the year 2008, 2013 and 2017. The overlay of the Electricity Transmission line ROW on the aerial photographs shows a very high and alarming building encroachment. The ground truth survey also tells the level of building encroachment with serious business activities going on in several positions of the Electricity Power line ROW such as timber market, welding and fabrication workshops, caravans for difference purpose of business, motor mechanic workshop etc.

VII. CONCLUSION

The completion of this study has demonstrated the justification and relevance of geospatial assessment of structures on Electricity Transmission Grid ROW using ground truth survey and remote sensing techniques. Remotely sensed data offers an alternative and precise measurement of object characteristics on the earth's surface and provides a more synoptic view to remote Terrain. Conclusively, the obtained spot image data sets were effectively utilized to obtain the results of the research objectives which show the standard 50m Electricity Transmission Grid ROW as recommended by TCN and NEC. Remote sensing technique should be employed for yearly map updating as a means of monitoring ROW encroachments. Finally, this study recommends an immediate and total removal of structures and business activities on the ROW of the study area and other areas

of ROW encroachment across the nation to forestall future damage and loss of life and properties.

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AUTHORS

First Author – EZE PROMISE IKENDA holds a B. Tech Degree in Land Surveying, RSU, and he is currently a master degree student in the Department of Surveying and Geomatics, Faculty of Environmental Sciences, Rivers State University, Port Harcourt. He is a practicing surveyor at Obomotu Surveys Limited, Port Harcourt. He is presently the Secretary General of Young Surveyors Network (YSN), Rivers State Branch Nigeria. Email- ezepromise4christ@gmail.com

Second Author – **RICHARD J. U.** holds a Bachelor & master degree in remote sensing and GIS and presently a Ph.D student in one of the Nigerian University. He is remote sensing and GIS Specialist. He is the Head of Business Development, Office of the Surveyor General, Rivers State Ministry of Lands and Survey, Rivers State of Nigerian. Email- Jeremaih.uriiah@yahoo.com.

Influence of Managerial Skills on Growth of Projects in Kenya: A Case of Uwezo Funded Youth Projects in Thika Town

Nduati Peter Kamau*, Dr. Mugambi Mercy M. **

*M.A Student: ODeL Department; University of Nairobi: Nairobi, Kenya

**Senior Lecturer, School of educational administration and planning, University of Nairobi: Nairobi, Kenya

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ABSTRACT- The Kenyan Government has committed huge financial resources to youth development projects through the Uwezo fund. Despite establishment of Uwezo fund, Kenyan youths are not utilizing the funds as projected by the government. A report by District Youth Officer in Thika indicates that twenty eight youth groups have taken up Uwezo fund amounting to Kshs 1,560,000 as at 31st December 2016. The total amount repaid as at 30th June 2017 was Kshs 631,890, translating to 40.71 % repayment rate. Only 18.5% of the youth groups have fully settled their loan, 81.5% of the youth groups have not yet fully settled their loan with 40.7% of the youth groups failing to pay any amount on the loan. High default rate and low repayment rate indicates that Youth projects are not running well in Thika. It is in this regard that this study assessed influence of managerial skills on growth of projects in Kenya. A case of Uwezo funded youth projects in Thika Town. The study was guided by four objectives to: establish influence of leadership skills on growth of youth projects, determine the influence of marketing skills on growth of Uwezo funded youth projects, to assess extent to which financial management skills influence growth of Uwezo funded youth projects and to examine extent to which monitoring and evaluation skills influence growth of Uwezo funded youth projects. Descriptive survey design was employed for study. The study targeted 28 youth group projects funded under Uwezo Fund in Thika town with a sample of 150 respondents participating in the study. Data was obtained using two instruments; Interview Schedule and Questionnaire. Quantitative data was analyzed by use inferential statistics and descriptive statistics while qualitative data was thematically analyzed based on specific objectives. From the study, it was established that majority of the youths had not attended leadership courses organized by Uwezo fund and many of them faced challenges in marketing their products. They also faced challenges in repaying their loans due to lack of adequate financial management skills. The study also established that though the youth carried out monitoring and evaluation of their projects they had no clear framework. The findings revealed that managerial skills have a positive influence on growth of Uwezo funded youth projects. The study recommends that before funding is done on a group, an elaborate and extensive training

should be carried out in order to prepare youths in advance. The training of youths should focus on the following areas; Business management, market research, market strategies, monitoring and evaluation strategies and business leadership. An elaborate monitoring and evaluation framework of the fund should be set to ensure proper utilization of the funds.

Index Terms: Managerial skills, growth of projects, Uwezo funded projects.

1.0 INTRODUCTION

In the last four decades, the Kenya government has recognized underemployment and unemployment challenge thus the successive government administrations have made employment creation a priority and as the core policy (Republic of Kenya 2008a; 2008b). During the implementation of second medium term plan (2008-2012), policies aiming at employment creation as the main objectives were formulated and majored more the youths. Crucial schemes in the sector include; Labor sector plan, Human Resource Development sector and youth (2008-2012) in addition to Kazi Kwa Vijana programme which was aimed to employ 200,000 and 300,000 young people (UNDP 2013). To address the problem of youth unemployment, the Kenyan government launched Uwezo fund, a vision 2030 flagship, that targeted at helping women youths and persons living with disability get money to grow their business and organizations at their respective constituency stage thus leading to growth of economy and also accomplishment of the MDGs (millennium development goals). On 8th September 2013, the fund was launched and enacted as legal notice No.21 of the Public Financial Management Act 2014 and published on 21st Feb 2014 (PFM ACT, 2014).

According to Njaramba and Ngugi (2014), Managerial skills influence owner's perception regarding their enterprises. Inadequate managerial training and skills lead to failure of an enterprise which is facilitated by inexperience and culture of the organization which act as a hindrance to growth of small and medium enterprises (SMEs). Manager or owners behavior can also influence business growth, in terms of his/her personality,

managerial skill and style. The entrepreneurs' behavior or management attitude on change can adversely affect growth of an enterprise (Leopolous, 2006; Naicker, 2006). A study conducted in Gauteng South Africa, on success factors of an enterprise concluded that inadequate managerial and technical skills affect development of an enterprise (Brink et al, 2003; Rogerson, 2008). Another study in South Africa conducted on SMEs showed that inadequate training and skills in management caused failure of projects. In a sample of 1000 entrepreneurs selected for the study, 90% believed that SMEs failure was caused by inadequacy of managerial skills (Rogerson, 2008). Business managers need learn more and more new skills to manage challenges and also for the growth of their organizations in addition, development of managerial skills is important for an organization to accomplish its objectives. Martin and Staines (2008) in their study on competencies in management of small firms noted that lack of personal qualities; managerial skills and inexperience were the main reasons for failure of small business firms. He further noted that high growth of firms and low growth of firms is determined by education, experience and training of senior manages.

The Kenyan government commits huge financial resources to the youths since it undertook a policy of financial devolution. Despite establishment of Uwezo fund, Kenyan youths are not utilizing the funds as projected by the government. Youths are still thriving in poverty despite that the fund is available at no interest. Youth that have accessed the Uwezo Fund have not yet come up with entrepreneurial projects that help them engage in income generating Activities (IGA). According to status report released by the Ministry for Public service, youth and gender affairs in June 2016, 19,461 youth group had benefited from the Kshs 5,119,680,571. Thika town was allocated Kshs 17,168,599 where 260 were the beneficiary groups consisted of youths, women and people with disability (GOK 2016).

1.2 Statement of the problem

A report by District Youth Officer in Thika indicates that twenty eight youth groups had taken up Uwezo fund amounting to Kshs 1,560,000 as at 31st December 2016. The total amount repaid as at 30th June 2017 was Kshs 631,890, translating to 40.71 % repayment rate. Only 18.5% of the youth groups have fully settled their loan, 81.5% of the youth groups have not yet fully settled their loan with 40.7% of the youth groups failing to pay any amount on the loan. High default rate and low repayment rate indicates that Youth projects are not running well in Thika. It is in this regard that this study assessed the influence of managerial skills on growth of projects in Kenya. A case of Uwezo funded youth projects in Thika Town. The skills that were investigated include leadership, marketing, financial management, monitoring and Evaluation.

1.3 Objectives of the study

The study sought to achieve the following objectives:

- i. To establish influence of leadership skills on growth of projects in Kenya. A Case of Uwezo funded youth projects in Thika Town.
- ii. To establish influence of marketing skills on growth of projects in Kenya. A Case of Uwezo funded youth projects in Thika Town.
- iii. To assess influence of financial management skills on growth of projects in Kenya. A Case of Uwezo funded youth projects in Thika Town.
- iv. To examine the influence of monitoring and evaluation skills on growth of projects in Kenya. A Case of Uwezo funded youth projects in Thika Town.

II. LITERATURE REVIEW

2.1 Concept of Project growth

The growth of SME can be defined in terms of turnover, income and profit increase leading to an increase in the number of employees or capital investment and increase in the overall worth of the enterprise (Fisher, 1998). National Baseline Survey by Kenyan government in 1999 indicates that there are various indicators that are used to measure growth, size, longevity, employees and entrepreneurial size (GOK, 1999). According to Leldom (1990), enterprise growth can either be vertical or horizontal. Growth of business vertically consists of transformation and graduation to more developed SMEs. Further, horizontal business growth involves formation of many enterprises at the same stage. Growth of business vertically is necessary for any business set-up as it is linked to employment creation. Mundia (2017) indicates that majority of firms in developing countries consist of small and medium sized firms (SMEs). According to Gupta et al (2013), growth is quantified using sales volume of the business. Qualitatively, it can be described using features such as product quality, market share as well as goodwill of the customer. Some organizations have used such ways to realize growth. They use a holistic approach that entails all channels for growth in their strategic planning (Thornton, 2012). For a firm to realize sustainable growth, it should scan the environment for opportunities and allocate resources for successful exploitation of resources. Firms with high growth have a direct contribution to national development and through provision of employment and poverty elevation (Mazzarol and Rebound 2009).

2.2 Concept of Uwezo Fund

Vision 2030 flagship aims for an equitable and socially just society with no extreme poverty and thus one of the main development agendas are poverty reduction and social equity. In order to address inequalities in the society, the Kenyan government has been on task to implement various initiatives which include avoiding gross disparities, average annual incomes, while rewarding talent and investment risks, 46% reduction in poverty, implementation of opportunities and access to social services and increased community empowerment. The vision for youth, gender and persons with disability in vision 2030 is equity of gender in power, resources distribution,

improvement of the livelihood for less fortunate groups and prosperous youths. Specific flagship projects and initiatives that have been identified under the vision 2030 include; poverty reduction and reduced income disparities, regional and gender parity in accessing of education and empowerment of community through increased efficiency and devolved fund impact (www.uwezo.go.ke).

The Kenyan government has come up with various funds to help in accomplishment of the above initiatives. Uwezo fund is among the funds introduced, which is a vision 2030 flagship targeting at aiding youths, women and people living with disability to access finances so that they can promote their business at constituency level, thus leading to growth of economy towards the realization of vision 2030 and sustainable development goals. Uwezo fund aims at giving opportunities for mentoring to the beneficiaries to help them take advantage of 30% government procurement priority through its ability to incubate enterprises catalyze innovation, promotion of industries, and creation of employment opportunities and growth of the economy. The objectives for existence of the fund include; expansion of access to finances in promoting women and youths enterprises and business for economic growth, creation of employment for women, youths and people living with disability and to devise an alternative funding framework which is driven by community (www.uwezo.go.ke).

2.3 Leadership skills and growth of Uwezo funded youth projects

Leadership skills in this study refer to how a person can influence a group of people to achieve a common objective. A group of people can be a company or firms own manager. Chambers and Conway (1992) notes that leadership consists of: innovation, employee motivation, creation of a good organization, among others. Project managers' lead by formulating value and ethics of the project, and transform the way projects carry out business in order to scale up its, effectiveness and efficiency (Dana 2001). An effective leadership is one which insists on encouraging over demands and appropriate regulation within a certain group of members. Dana (2001) notes that organizing tasks and workshop for company management helps them become aware of positive leadership styles' effectiveness. When leadership offers feedback that is positive and members of the group respond with good work, results can be beneficial leading to a more content and more successful projects. Entrepreneurs and managers need to be flexible because a group member responds differently to various leadership styles in different manners. Some members simply like being left alone while others need good feedback and encouragement. Great understanding of the effect your leadership has on a person is a sign of a capable manager (Landale, 2006). According to Mundia (2017), an organization should have adequate leadership skills to enhance achieving enterprise objectives. Adequate leadership skills in Planning, organizing, controlling and leading can play a great role in increasing annual profits for an organization. To enhance these skills, business owners can consider enrolling for leadership

courses and also through attendance seminars, workshops, sensitization meetings and reading further. Ongera, Nyakundi and Nyang'au (2016) in their study on factors influencing access to Uwezo fund by citizens in Kenya in Nyamira County found out that leadership conflict in groups had a negative influence on access to Uwezo Fund.

2.4 Marketing skills and growth of Uwezo Funded youth Projects

Marketing means a way of selling services or products and promotion including advertising and market research. Several advertising and methods of delivery include; television banners, commercials, newspapers, logos on cloths, Web sites, magazines, billboards and radio stations. Personal selling is one of the best methods of promotion since it enhances connection between a seller and a consumer. In this technique, a salesman is in position to listen and know the needs of a buyer through inquiry and obtaining information from them. Moreover, activities of personal selling are in a position to produce a long-standing relationship between sellers and consumers that frequently bring up many purchases in repeat. Personal selling may come up through videoconferencing, telephone conferences, and computers. The main challenge that faces personal selling is the high cost entailed. Some of services and products promoted via this method include: life insurance, real estate and automobiles, among many more products (Churchill and Peter, 1995). Muraga (2013) cites lack of market structures and sites for display and marketing of youth enterprise products as a hindrance to business growth. There is also limited international exposure for Kenyan youth entrepreneurs due to lack of sufficient resources to facilitate such exposure. In order for youths to be successful, they need a good capacity building support and training to support them comprehend and understand how to apply a vast range of concepts in business such as value addition, purchasing, risk management, sales on credit, income planning and allocation, basic keeping of records, product pricing and costing, market knowledge, negotiating and bargaining techniques, developing a market plan, processing, production and packaging methods (Makokha 2013)

Karanja et al 2013 notes that SMEs face many challenges that prevent them from reaching their goals. One of the main challenges in marketing is lack of information. Many SMEs depend on traditional forms of information such as business friends and personal contact with the customers. This is caused by lack of skills by SMEs owners, poor network system and lack of understanding of marketing. Most of SMEs do not practice the marketing strategies which recognize the supremacy of Customers. SMEs need to adopt promotional strategies in publicity, sales promotion and advertising in order to influence demand. SMEs can use different media to sell their products for example radio due to its wide coverage and television since it combines visual and audio. SMEs have limited networks to exchange information due to a number of factors. Mumbi, (2011) indicate that Major challenges faced by young entrepreneurs include selling products outside the country,

dealing with competition, keeping up with level of technology, organizing events to market their business and setting aside finance for marketing, designing and promotion. According to Kenya National Bureau of Statistics (KNBS 2016), companies normally advertise their products in order to create awareness among the consumers. However a survey by MSME revealed that most MSMEs do not market or advertise their goods and services at all and instead they depended on quality of products and customer satisfaction (KNBS 2016).

2.5 Financial management skills and growth of Uwezo Funded youth Projects

Financial management skills refers to aptness of the youths to manage money given by the fund officers in charge of Uwezo fund or other sources through appropriate records keeping, financial supporting and budget. One of the major resources in project is finance thus attention should be directed to it if projects for youths are survive. Some tasks of finance in youth groups need to be monitored, recorded, and planned. Financial management is a key activity in projects in general and organization due to great demand for a good project planning. Financial planning involves coming up with objectives, examination of resources and assets, estimation of future, determination financial needs and setting up a road map to accomplish monetary objectives (Madison 2009). He further, confirmed that, a procedural approach for attainment of effective financial management performance is budgeting and financial planning. Further, sustainability of any project depends on effective financial management starting from the first stage to the last stage. It is crucial to prepare a budget for any amount of money that is received. Schoonover (2010) notes that project officers understand the project well and are aware of its stages in terms of products, management, finances, competition and market. In spite of well laid plans, some youth groups in Thika town are still experiencing low growth rate and are not in a position to pay back the loan advanced to them by the Uwezo fund. Correspondingly, (Sanga, 2009) indicted that planning of finance begin with evaluation of the current financial position, he further suggested that a person should understand debts, credits and where their financial position stands. Connell (2008) reckon that financial management and planning belongs to all in a project. Further, he stress that everyone is a financial planners and that every person has a plan at particular stage. Comparing the mentioned opinion, some youths in the involved in projects, do not believe they are financial planners thus being isolated in running the project. Therefore, this threatens growth and expansion of their projects.

Pandey (1997), indicate that the ground for financial analysis, decision making and planning, is information on finance. Information on finance is required to show, contrast and evaluate the sustainability of the projects. Information on finance of an organization is found in financial statements of an organization. They have more information that business leaders can use to analyze project performance in the past. The function of financial statements in an organization is basically to monitor the value of services and goods in and out of an organization in terms of money. Therefore, youths should have a sound financial

management plan to ensure their projects grow (Stoner 2007). Financial accounting is that which entails book keeping that records daily activities of finance and preparing the accounts. Financial information can be given to those individuals who need such data for making decision and purpose of making records According to Chandra (2007), financial management plans are crucial since they give a basis for reports required by banks, governmental agencies and potential funders trust organizations. They further provide a picture of the direction an organization is heading and how it is doing. Some organizations, like the youth projects and small firms, may not achieve good keeping of records for it may be costly and may require qualified personnel and facilities. Good business record keeping helps in sustaining and expanding an organization and in its absence business runs at risk having financial crisis and wastage of money and opportunities to expand (Sanga, 2009). In a study on factor influencing performance of Uwezo fund supported projects in Bomet County Chepkoech (2016) found that majority of beneficiaries who received Uwezo fund were not trained on financial management which led to misuse of project funds.

2.6 Monitoring and evaluation skills and growth of Uwezo funded youth projects

Monitoring and evaluation (M&E) means systematic collection and analysis of information at regular intervals about ongoing projects in order to compare the actual project impacts against the set objectives to factitive decision making. According to UNDP 2009, M & E makes it possible to establish if the intended goals have been achieved or not. If there are deviations, corrective measures are put in place to ensure that the project is on track to attain the desired results. The Global conference on Youth Enterprise Employment and Livelihoods Development (YEELD 2008) identified problems that face M & E and their impact on evaluation as: diverse nature of Monitoring and evaluation process, inflexibility, inability to come up with intended program outcome or impact, adaptability, lack of a well-designed impact evaluation that is characterized to program intervention to ethical consideration, change of beneficiaries and incorporation of Gender in monitoring and evaluation difficulty.

According to Patton (1999) successful implementation of any project depends on monitoring and evaluation which is a systematic collection and analysis of data and which should be continuous on specific indicators in providing stakeholders and management with an indication of project progression and objective achievement. M & E thus forms an important part for success of the project. Lack of accurate and timely information poses a challenge to effective and efficient management of a project or program. M & E of project undertakings provides a project and program managers with good avenue for learning from previous encounters, service delivery improvement, allocation of resources, and demonstration of results so as to accountable to key stakeholders. Sustainability and success of a project greatly rely on constant results on the project continuing activities (Mark, Hanry and Julness, 2002). In the execution of management work in a project, project officers set clear

performance guidelines, check them and record actual performance. By conducting M&E Comparison against the result, plans and standards is carried out. One of the reason as to why project fail is due to lack of monitoring and control. Monitoring helps the management to know and determine pending challenges in a project. Further, it presents a ground for corrective measures, both operative and substantive to help improve a project design or a program, way of implementing and results quality. Moreover it aids in reinforcement of earlier positive result.

2.7 Theoretical framework

The study is based on two theories: Contingency Leadership Theory and Systems Theory of Management.

2.7.1 Contingency Leadership theory

Contingency Leadership theory was put forward by Fred Edward Fiedler Austrian psychologist in 1994. It is based on the principle that an organization is an open system which continually interacts with its environment. It assumes that organization operations efficiency depends on its ability to scan and comprehend situational factors like environment. The strengths of this theory is that managers of organizations can effectively apply it to manage individual differences across organizations which are facing different contingency variables and are in need to be managed differently. It also emphasizes the need for managers to manage their organizations depending on complex varieties of important environmental and internal contingencies. The theory also put a lot of emphasis on the

dynamic nature of organizations, people and situations and how they change over time. This enables organizational management to be tailored to the prevailing circumstances in achieving desired goals and objectives. The main disadvantage of this theory lies in its rigid nature, that is, it looks at a firm as being in a position to add relevance in the environment always thus it remaining at equilibrium. Researcher therefore, adopted this theory since the growth of youth projects will be greatly determined by managerial skills in that particular project.

2.7.2 Systems Theory

Systems theory was initially proposed in 1950 by Van Bertalanffy. The theory was later modified by Katazkhan in 1966 to fit diverse organizational settings. This theory indicates that each system has elements that are independent from each other but are interrelated. It is therefore important for the management at the top to understand how the system theory operates. The assumption of this theory is that there is an interdependence between people and also exists an impact of the external environmental on structure of the organization. The relevance of this theory to the study is that it connects a person, group or department within the youth project to work as a one unit. This theory therefore propose that the responsibility of ensuring that the growth of youth projects does not only depend on those in charge, but also to everyone in the organization. Therefore everyone should co-ordinate to ensure flow of information.

Conceptual framework

Independent variables

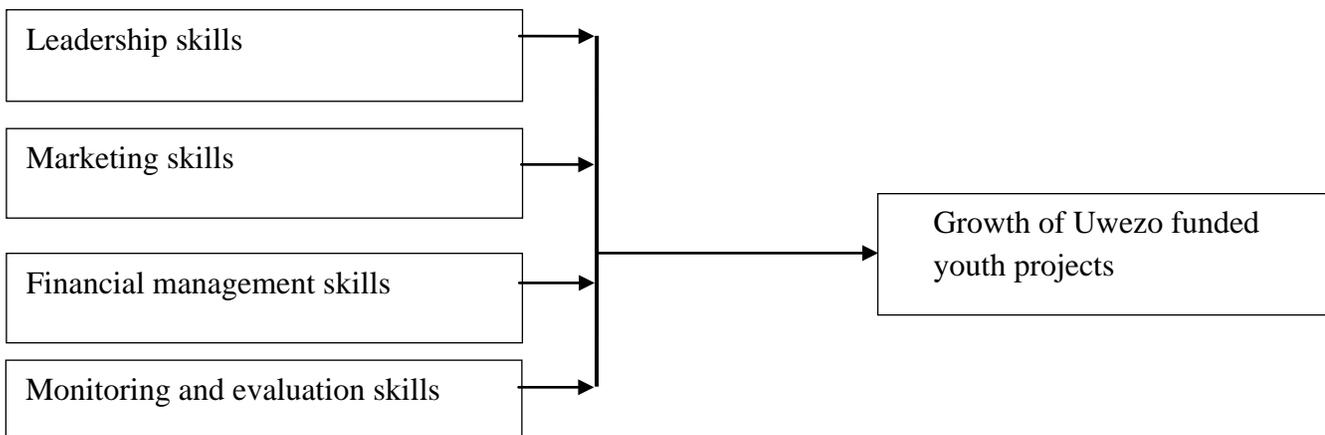


Figure 1: Conceptual framework

III. METHODOLOGY

Descriptive survey design was employed for study. The study targeted 28 youth group projects funded under Uwezo Fund in Thika town with a sample of 150 respondents participating in the

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study. Data was obtained using two instruments; Interview Schedule and Questionnaire. Quantitative data from interview schedule and questionnaire was analyzed by use inferential statistics and descriptive statistics while qualitative data was thematically analyzed based on specific objectives. Multiple

regression analysis was also used to predict influence of independent variables on the dependent variable.

IV. DATA ANALYSIS, PRESENTATION AND INTERPRETATION OF FINDINGS

4.1 Leadership skills and Growth of Uwezo funded youth projects

This objective sought to determine influence leadership skills on growth of Uwezo funded youth projects in Kenya. Investigation was on whether the beneficiaries had attended any leadership course offered by Uwezo fund, whether they had teamwork in the running of their projects, whether as part of the leadership they had been sorting any consultation over their project and whether they had any networking with other youths. The findings are as presented in subsequent tables

4.1.1 Responses on leadership Courses attendance

The Respondents were required to indicate whether they had attended any leadership course organized by Uwezo fund. Results were obtained and analyzed and shown in Table 1

Table 1: Responses on leadership Courses attendance

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	42	28.0	28.0	28.0
No	108	72.0	72.0	100.0
Total	150	100.0	100.0	

From Table 1, 108(72%) respondents reported that they had not attended any leadership course organized by Uwezo Fund while 42(28%) respondents indicated that they have attended a leadership course organized by Uwezo fund. This implies that majority of the youths lacked proper leadership skills to learn their project which may affect growth of their projects.

4.1.2 Teamwork in project operation

The researcher sought to know whether the respondent embraced teamwork in the course of running their project. Results were obtained, analyzed and tabulated in Table 2

Table 2: Responses on whether they had teamwork in project operation

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	108	72.0	72.0	72.0
No	42	28.0	28.0	100.0

	Frequency	Percent	Valid Percent	Cumulative Percent
Total	150	100.0	100.0	

Results in Table 2 indicate that 108(72%) respondents had teamwork during the operation of their projects while 42(28%) respondents indicated not to have teamwork in operation of their projects.

4.1.3 Consultation over the project

The researcher was interested to know whether the respondents were consulting over their projects. Results were obtained and tabulated in Table 3

Table 3: Responses on Consultation over the project

	Frequency	Percent	Valid Percent	Cumulative Percent
No	29	19.3	19.3	19.3
Yes	121	80.7	80.7	100.0
Total	150	100.0	100.0	

From table 3, 121(80%) respondents have been consulting about their projects while 29(19.3%) respondents reported not to have consulted over their projects. Majority consulted over their projects and this helped to run the project efficiently since they got guidance. Those who did not consult may have faced challenges in running their projects.

4.1.4 Networking with other youth groups

Respondents were asked to indicate whether they networked with other groups. Responses were obtained and analyzed and shown in Table 4

Table 4: Responses on networking with other youth groups

	Frequency	Percent	Valid Percent	Cumulative Percent
No	112	74.7	74.7	74.7
Yes	38	25.3	25.3	100.0
Total	150	100.0	100.0	

Results in Table 4 indicate that 112(74.7%) respondents did not have been networking with other beneficiaries while 38(25.3%) respondents indicated that they had been networking with other beneficiaries. Majority of the respondents did not network with other groups which mean that they did not share knowledge and ideas which are crucial for growth of projects. Those who networked may have used ideas and knowledge to grow their projects.

4.1.5 Leadership skills and growth of Uwezo funded youth projects.

The study sought to establish whether leadership skill led to growth of Uwezo fund youth projects. Data was obtained from the respondents analyzed as shown in Table 5

Table 5: Responses on Leadership skills and Growth of Uwezo funded Youth projects

	Frequency	Percent	Valid Percent	Cumulative Percent
strongly disagree	42	28.0	28.0	28.0
Disagree	24	16.0	16.0	44.0
Agree	24	16.0	16.0	60.0
strongly agree	60	40.0	40.0	100.0
Total	150	100.0	100.0	

Table 5 shows that 60(40%) of respondents strongly agree that leadership skills have led to growth of their projects, 42(28%) respondents strongly disagree that leadership skills have led to the growth of Uwezo funded youth projects, 24(16%) respondents disagree that leadership skills have led to growth of Uwezo funded youth projects, 24(16%) respondents agree that leadership skills have led to the growth of youth projects. District youth fund officer indicated that leadership is crucial in running a projects and advocated youths to enroll for leadership courses so that the can get the right skills before and after funding.

4.2 Marketing skills and Growth of Uwezo funded youth projects

This objective sought to establish the influence of marketing skills on growth of Uwezo funded youth projects. The indicators that were investigated include; Method of marketing products they use. The respondents were also to indicate whether they face challenges in marketing their products and whether or not they agree or disagree that marketing had led to the growth of Uwezo funded youth projects.

4.2.1 Methods of marketing products

The study sought to establish on the method that the youths use to market their products. Results from the respondent were obtained and tabulated in table 6

Table 6: Responses on methods of marketing products

	Frequency	Percent	Valid Percent	Cumulative Percent
Advertising	60	40.0	40.0	40.0
Personal selling	42	28.0	28.0	68.0
sales promotion	21	14.0	14.0	82.0
Others	27	18.0	18.0	100.0
Total	150	100.0	100.0	

Results in Table 6 indicate that 60(40%) respondents preferred to use advertising method to market their products, 42(28%) respondents reported that they use personal selling to markets their products, 21(14%) respondents indicated that they use sales promotion as a way to market their products and 27(18%) respondents indicated that they use other methods to market their products. This indicates that youths lack clear marketing structures for marketing their products.

4.2.2 Difficulties experienced in marketing products

The researcher was interested to know whether the respondent faced difficulties in marketing their product. Data obtained was analyzed as shown in Table 7

Table 7: Responses on Difficulties experienced in marketing products

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	116	77.3	77.3	77.3
No	34	22.7	22.7	100.0
Total	150	100.0	100.0	

Table 7 indicate that majority of the respondents 116(77.3%) reported that they encountered difficulties in marketing their products while 34(22.7%) respondents indicated that they did not face difficulties in marketing their products.

4.2.3 Marketing skills and growth of Uwezo funded youth projects

The study sought to establish whether marketing skills have led the growth of Uwezo funded youth projects. The respondents responded and results were analyzed and tabulated in Table 8

Table 8: Response on marketing skills and growth Uwezo funded Youth projects

	Frequency	Percent	Valid Percent	Cumulative Percent
strongly disagree	14	9.3	9.3	9.3
Disagree	29	19.3	19.3	28.7
Agree	61	40.7	40.7	69.3
strongly agree	46	30.7	30.7	100.0
Total	150	100.0	100.0	

Results in Table 8 indicate that 61(40.7%) respondents agreed that marketing skills have led to growth of their projects, 46(30.7%) respondents strongly agreed that marketing skills have led to the growth of their projects, 29(19.3%) respondents disagreed that marketing skills have led to the growth of their

projects and 14(9.3%) respondents strongly disagree that marketing skills have led to the growth of the of their projects.

4.3 Financial Management skills and growth of Uwezo Funded youth projects

This objective sought to establish the influence of financial management skills of growth of Uwezo funded youth projects. Indicators that were used focused on management of finances in the project, whether they sourced extra funding from Uwezo, whether they faced any difficulties in repayment of the loan. Beneficiaries were also asked to rate their financial management skills and to indicate whether Financial management skills have led to the growth of Uwezo funded youth projects.

4.3.1 Ways of managing finances in the project

The researcher was interested to know ways in which the respondents used to manage their finances. Responses for the respondents was obtained and tabulated in Table 9

Table 9: Responses on ways of management of finances in the project

	Frequency	Percent	Valid Percent	Cumulative Percent
Budget	25	16.7	16.7	16.7
Report	40	26.7	26.7	43.3
Record	85	56.7	56.7	100.0
Total	150	100.0	100.0	

Results in table 9, show that 85(56.7%) respondents reported that they use records to manage their finances in their projects, 40(6.7%) respondents indicated that they reports to manage their finances while 25(16.7%) respondents report they used Budget to manage their projects. Use of records to manage finances indicates that youths have knowledge in record keeping. Minority used budget to manage their finances.

4.3.2 Sourcing extra funding from Uwezo

The researcher sought to know whether the respondents have sourced extra fund from Uwezo. Results from the respondents were analyzed and tabulated in Table 10

Table 10: Responses on whether they had sourced any extra funding from Uwezo

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	58	38.7	38.7	38.7
No	92	61.3	61.3	100.0
Total	150	100.0	100.0	

Results in Table 10 indicate that 92(61.3%) respondents have not sourced for extra funding from Uwezo fund while 58(38.7%) respondents have sourced extra funding from Uwezo fund. Majority had not sourced extra funding; this may be due to outstanding loan balance that they had not cleared.

4.3.3 Difficulties experienced in repayment of the Uwezo fund Loan

The study sought to establish whether the youths experienced difficulties in repayment of their loan. Responses from the respondents were analyzed and presented in Table 11

Table 11: Responses on whether they experienced any Difficulties in repayment of Uwezo fund loan

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	68	45.3	45.3	45.3
No	82	54.7	54.7	100.0
Total	150	100.0	100.0	

Results in table 11 indicate that 82(54.7%) respondents' did not experience difficulties in repayment of the loan while 68(45.3%) respondents reported to experience difficulties in repayment of the loan. District youth fund officer indicated that 18.5% had fully settled their Loan while 81.5% had not fully settled their loans. He further noted that some 40.7% had defaulted their loans.

4.3.4 Rating of financial management skills of the beneficiaries

The researcher asked the respondents to rate their financial management skills. Results were obtained, analyzed and presented in Table 12

Table 12: Responses on Rating of financial management skills

	Frequency	Percent	Valid Percent	Cumulative Percent
very adequate	55	36.7	36.7	36.7
fairly adequate	59	39.3	39.3	76.0
Adequate	23	15.3	15.3	91.3
Inadequate	13	8.7	8.7	100.0
Total	150	100.0	100.0	

Table 12 indicate that 59(39.3%) respondents rated their financial management skills as fairly adequate, 55(36.7%) respondents rated their financial management skills as very adequate, 23(15.3%) respondents rated their financial management skills as adequate and 13(8.7%) respondents their financial management skills as inadequate.

4.3.5 Financial management skills and growth of Uwezo funded youth projects

The study sought to assess whether financial management skills have led to the growth of Uwezo funded youth projects. Responses were obtained and tabulated in Table 13

Table 13: Responses on financial management skills and growth of Uwezo funded youth projects

	Frequency	Percent	Valid Percent	Cumulative Percent
strongly agree	85	56.7	56.7	56.7
Agree	45	30.0	30.0	86.7
Disagree	20	13.3	13.3	100.0
Total	150	100.0	100.0	

Results in table13, indicate that 85(56.7%) respondents strongly agree that financial management skills have led to the growth of Uwezo funded youth projects, 45(30%) respondents agree that financial management skills have led, 20(13.3%) respondents disagree that financial management skills have led to the growth of Uwezo funded youth projects. District youths fund officer noted that they have carrying out financial training to the youths. He further indicated that more training is required for them to run their projects well.

4.4 Monitoring and Evaluation skills and growth of Uwezo funded youth projects

The last objective of the study was to examine the influence of monitoring and evaluation skills on growth of Uwezo funded youth projects. The study sought to find out whether the beneficiaries had done any monitoring and evaluation of their project and whether they prepared periodic reports on the project. Beneficiaries were required to rate their monitoring and evaluation skills and were also required to indicate whether monitoring and evaluation has led to the growth of Uwezo funded youth projects. Results were obtained and analyzed as shown below.

4.4.1 Monitoring and evaluation carried out

The respondent was interested to whether the respondents had carried out monitoring and evaluation of their projects. Responses were obtained, analyzed and tabulated in table 14

Table 14: monitoring and evaluation has been carried out on the project

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	114	76.0	76.0	76.0
No	36	24.0	24.0	100.0
Total	150	100.0	100.0	

Results in table 14, indicate that 114(76%) respondents carried out monitoring and evaluation of their projects while 36(24%) respondents reported that they did not carry out monitoring and evaluation of their projects. Carrying out monitoring and evaluation indicate that the respondents kept track of their project and could avert risk that posed a threat to their project.

4.4.2 Periodic report writing

The study sought to find out whether the respondents wrote period report in order to monitor their project progress. Results were obtained and tabulated in Table 15

Table 15: Response distribution periodic report writing.

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	105	70.0	70.0	70.0
No	45	30.0	30.0	100.0
Total	150	100.0	100.0	

Table 15 indicates that 105(70%) respondents wrote periodic reports on progress of their projects while 45(30%) respondents reported not to have written periodic reports. Reports are important in running of project. Majority wrote periodic reports on the progress of their projects.

4.4.3 Rating of monitoring and evaluation skills

Respondents were requested to rate their monitoring and evaluation skills. Results were tabulated and presented in Table 16

Table 16: Responses on rating of monitoring and evaluation skills

	Frequency	Percent	Valid Percent	Cumulative Percent
Very adequate	23	15.3	15.3	15.3
fairly adequate	80	53.3	53.3	68.7
Adequate	36	24.0	24.0	92.7
Inadequate	11	7.3	7.3	100.0
Total	150	100.0	100.0	

Majority of the respondents 80(53.3%) as fairly adequate, 36(24.0%) respondents rated their monitoring and evaluation as adequate, 23(15.3%) respondents rated as very adequate while 11(7.3%) respondents rated as inadequate.

4.4.4 Monitoring and evaluation skills and growth of Uwezo funded youth projects

The study sought to establish level of agreement on extent to which monitoring and evaluation skills have led to growth of Uwezo funded youth projects. Responses were obtained and tabulated in Table 17

Table 17: monitoring and evaluations skills to growth of Uwezo funded youth projects

	Frequency	Percent	Valid Percent	Cumulative Percent
strongly agree	18	12.0	12.0	12.0

Agree	26	17.3	17.3	29.3
Neutral	18	12.0	12.0	41.3
Disagree	48	32.0	32.0	73.3
Strongly Disagree	40	26.7	26.7	100.0
Total	150	100.0	100.0	

Analysis in table 17, indicate that 48(32%) respondents strongly disagree that monitoring and evaluation skills have led to the growth of Uwezo funded youth projects, 40(26.7%) respondents disagree that Monitoring and evaluation skills have led to the growth, 26(17.3%) agree that monitoring and evaluation skills have led to the growth, 18(12%) respondents strongly agree that monitoring and evaluation have led to the growth, 18(12%) respondents were neutral.

4.5 Multiple regression analysis

The inferential statistics was used in the study to verify whether a relationship between the variables as well as the strength of that relationship was there. Inferential analysis targeted at reaching to a conclusion that goes further form data obtained between the independent and dependent variables in the study (leadership skills, marketing skills, financial management skills and monitoring and evaluation skills). Results were obtained and tabulated in Table 19.

Table 19: ANOVA

Model	Sum of squares	Df	Mean square	F	Sig.
Regression	2.535	2	1.269	5.456	0.25
Residual	9.308	150	2.328		
Total	3.466	149			

*** ** significant at 5% level

Results in Table 19 indicate that F critical at 5% significance level was 3.466. Calculated F was found to be 5.456 which was greater the F critical, this indicated that the whole model was

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significant to the study. Significance value obtained was 0.25 which is less than 0.5 significance level of the study. This further indicate that model was statistically significant in prediction of how leadership skills, marketing skills, financial management skills and monitoring and evaluation influence growth of Uwezo funded youth projects in Thika town.

Table 20: Significance of the variables in the model

Model	Unstandardized coefficient	Standardized coefficient	T	Sig.
	B	Std error	Beta	
(Constant)				
Growth of Project	3.026	.733	2.127	.000
Leadership skills	.269	.225	.202	.293
Marketing skills	.172	.155	.147	.433
Financial Management skills	.201	.222	.016	.939
monitoring and evaluation skills	.233	.153	.232	.191

The study carried out multiple regression analysis to verify relationship between independent variables and dependent variable. The regression equation was:

$$Y = 3.026 + 0.269x_1 + 0.172x_2 + 0.201x_3 + 0.233x_4 + \epsilon$$

Where:-

Y= Influence of managerial skills

β_0 =constant

$\beta_1, \beta_2, \beta_3$ and β_4 = regression coefficients

X_1 = leadership skills

X_2 = Financial management skills

X_3 = Marketing skills

X_4 = Monitoring and evaluation skills

ϵ =Error Term

In accordance to the regression model employed, considering all determinants into account (leadership skills, marketing skills,

financial management skills and monitoring and evaluation skills) constant at zero, increase in a unit in leadership skills resulted to 0.269 increase in growth of Uwezo funded youth projects, increase in a unit in marketing skills resulted to a 0.179 increase in growth of Uwezo funded youth projects, increase in a unit in financial management skills resulted to 0.201 increase in growth of Uwezo funded youth projects and a unit increase in monitoring and evaluation resulted to 0.233 an increase in growth of Uwezo funded youth projects, hence the most significant determinant was leadership skills. From the analysis Leadership skills had the greatest influence in growth of Uwezo funded youth projects, Monitoring and evaluation skills had a greater influence while financial management skills and marketing skills followed respectively.

V CONCLUSION AND RECOMENDATION

5.1 Conclusion

From the finding of the study, it was noted that managerial skills have a positive influence on growth of Uwezo funded youth projects. Managerial skills have led to the growth of Uwezo funded youth project since working capital of youth projects have increased, employment has been created and also their projects have expanded in terms of their operation. It is also evident that Uwezo funded youth projects are faced with several challenges in attempt to empower youths to be self-reliant. Most of the youths did not attend leadership course that was organized by Uwezo fund. This means that they did not benefit from information and it negatively affected running of their project. Youths should improve their skills in leadership so that they can do better in their projects. Skills should be improved by enrolling for short courses in leadership and further by attending seminars, reading more, and workshops. Marketing challenges that youths faced indicated that they lacked proper skills to market their products and this impacted negatively on growth of Uwezo funded youth projects. Loan repayment challenges were as a result of mismanagement of finances. Youths lacked proper monitoring and evaluation framework that negatively affected their monitoring and evaluation skills. Inadequate training and managerial skills is a great cause of organization failure which is facilitated by inexperience and organizational culture thus hindering growth Uwezo funded youth projects.

5.2 Recommendations of the study

Based on the findings, the following recommendations were made.

- i. Before funding is done on a group, elaborate and extensive leadership training should be carried out in order to prepare youths in advance in project leadership.
- ii. Youth should come up innovative marketing strategies and ideas that will help them to sell their products and avert the challenges they are facing.

- iii. The government should consider training the youth on financial management skill to be able to service their UWEZO fund loans and also expand their businesses.
- iv. An elaborate monitoring and evaluation framework of the fund should be set to ensure proper utilization of the fund and youths to be taken through M & E training in order to establish a baseline against which to measure progress of their projects.

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AUTHORS

First Author – Nduati Peter Kamau. He is pursuing Master of Arts in Project Planning and Management at University of Nairobi (UON): Nairobi, Kenya. He is a qualified agronomist by profession, Certified Public Accountant of Kenya and a Member of Institute of Certified Public Accountant of Kenya (ICPAK). Email: peternduati954@gmail.com

Second Author – Dr. Mugambi Mercy M., Senior Lecturer in the School of educational administration and planning at University of Nairobi (UON), Nairobi, Kenya. She is an expert in Curriculum development having attained a PhD in Curriculum studies. Email: mugambimercy@yahoo.com

Does microcredit affect poverty reduction in Macedonia?

Vjolca Hasani Limani, Ph.D. c.*, Prof. Dr. Seadin Xhaferi**

*Department of Finance, Faculty of Economics University of Tetova

**Department of Finance, Faculty of Economics University of Tetova

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Abstract

Microcredit has shown positive effects on poverty reduction in many countries. Considering the fact, that we faced a lack of studies about this topic in Macedonia, this paper will have a great impact on informing the researchers, institutions and society about this issue. This will affect the improvement of policies and programs for poverty reduction.

The main question addressed in this study is, has microcredit affected poverty reduction in Macedonia? The problem is treated through incomes and expenditures of the households. The study is based on a survey conducted with 199 households, while the result depends on the vectors of household characteristics. The sample was divided into two groups: households treated with microcredits and households that have not been treated with microcredits.

In order to obtain an accurate result, firstly we have used descriptive statistics (mean, standard deviation and p -value). We have used fixed-effect regression models on panel data, to analyze the dependent variables. The results obtained from these models suggest that, microcredit has not shown a significant positive impact on poverty reduction, respectively in the increase of household incomes. Households that were treated with microcredit have an increase in income but a decrease of living expenditures. Households that have received consumption credit have increase on income and on expenditures, but these results do not differ much from the income and expenditures of households that have not received loans.

Key words: Microcredit; poverty; household; income; expenditure; Macedonia.

I. INTRODUCTION

Poverty is one of the greatest challenges of humanity, but it is not initiated by the poor. It has come as a result of non-inclusive policies and financial institutions, who have excluded the poor from access to financial resources and raising capital to generate income.

Microfinance as an economic notion has started to be recognized since the 1990s, as well as some attempts similar to the functional mechanisms of microfinance, have begun to be used since then. Since the beginning of the application of these mechanisms for borrowing financial funds that have been initiated by microfinance, many studies and researches have been conducted by researchers, in different countries of the world, whose results have often been different from one another. So, there are many researchers who accept the effects of microfinance on poverty reduction, other authors who express scepticism, but some even express their contradiction to this microfinance theory. Microfinance has been proven as an effective and powerful mechanism for poverty reduction. However, like many of the other development tools, it has not penetrated enough into the poorest sections of society.

Given that the most common and most used microfinance mechanism is microcredit itself, this study will analyze its impact in income, consumption expenditures, and living standards of households in Macedonia. Some elements of microfinance are present in Macedonia, even though there is no legal basis to regulate their functioning. Also, the basis for the functioning of microfinance institutions in the country is still not much clearly regulated. Although microfinance is applied in Macedonia, there is still a gap in literature, studies and publications that will address the results which have emerged from the application of microfinance in the country.

One of the biggest problems, we have faced while studying microfinance through empirical models, is the fact that in Macedonia there is a lack of detailed survey data. In fact, this paper is among the few studies that have been conducted in Macedonia, because we have faced a lack of literature or publications on this topic.

1.1 Literature review

Microfinance is an important mechanism, which, if provided with appropriate conditions, is sufficient to meet the needs of a large number of the population, including those living below the poverty line. In the study of (Morduch J. & Hailey B., 2002)[1], empirical indicators prove that the poor can benefit from microfinance, both in social and economical aspects, without jeopardizing the financial sustainability of microfinance institutions. However, if microfinance will be used, we will need aspecific targeting of the categories; poor and very poor people. Without this categorization, microfinance institutions (MFIs), have it impossible to create appropriate programs focused to those groups. According to (Rodman D. & Qureshi U., 2006) [2], microfinance involves a delivery of a variety of financial services to the poor society: savings, insurances, money transfers and loans. Microfinance has mostly favored

microcredits, and types of microcredit can be viewed as a broad spectrum of microfinance institution services. While (Khavul S., 2010)[3], says that microfinance provides some innovative solutions to avoid problems which may come as a result of adverse selection, moral hazard, and transaction costs. Charity is not a solution to poverty; it creates dependence and lowers self confidence, says (Alam M. & Getubig M., 2010) [4] in his study. He further points out that microcredit can create self-employment almost immediately, while women have the highest rate of poverty and suffer most from its consequences, but on the other hand they are factors that have the most direct impact on their families. The study of (Branjeree A. et.al., 2015) [5] concludes that microfinance affects job offer solutions, here we note that households that have access to credit, noticeable engagement is seen in their businesses, while in other conditions they have been forced to shorten the jobs. Thus, microcredit plays its role as a financial product, in an environment where access to credit and savings is limited for the poor. Based on the survey, in his study (Khandker S.R., 2005) [6] has found strong results at the levels of micro economy and macro economy, thus microcredit has contributed to poverty reduction among poor borrowers, as well as within local economy. Impact seems to be greater for families who have been very poor. (Chemin M., 2008) [7], found that microfinance has had a positive impact on participant's spending on microcredit programs, on labor supply, and on education, for both men and women. According to (Imai K. & Azam SH., 2012) [8], it can be inferred from the obtained results that the loans offered by microfinance institutions have had significant effects in poverty reduction, particularly in income and consumption of households.

According to the study of (Boateng G. et.al., 2015) [9], the results showed that microfinance has had a positive impact on all the variables under consideration, not including the participants of the religions and social activities that were initiated from other non-financial factors. Also according to a study by (Swain R. & Floro M., 2012) [10], microfinance has resulted as an opportunity that provides additional sources for reducing consumption, thereby reducing variability and differentiation in consumption levels. On the other hand (Imai, Arun & Annim, 2010) [11] have proven positive impact, with particular emphasis on productive loans. These effects were more common in rural areas than in urban areas. Also the study of (Akotey & Adjasi, 2016) [12], it has been shown that families who have used microcredit in combination with micro-insurance have had higher results in terms of improving their well-being. They point out that micro-credit is good, but the benefits may be higher and more stable for the poor if the risk is covered by micro-insurance. (Moll H.A.J) [13], say that there are two opposing views on microfinance; loans for target groups and postponement of the financial limit; which can be joined to a new approach for formulation of new policies, such as stability and expansion. In the meanwhile (Mazumder & Lu, 2015) [14] have found that microfinance has shown an impact on the growth of fundamental rights, thus has improved the livelihoods and well-being of respondents. Also, (Brau J. & Woller G., 2004) [15] among others say that, tools, models and frameworks in existing financial literature, can be supportive to tackle the world poverty problem, and have the potential to move forward, as the theory also the microfinance practice. This because microfinance provides a fairly good financial opportunity, in order to enable significant positive changes in the lives of millions of poor people.

1.2 Poverty and Microfinance in Macedonia

Macedonia is the last state that has emerged from the former Republic of Yugoslavia, and has since passed through a period of transition and development. In recent years, Macedonia is considered a developing country. The World Bank, puts Macedonia on the group of upper mid-income states, which has made great strides in reforming its economy over the last decade. Much more efforts are still needed to generate economic growth and improve living standards for all. Poverty is estimated to have fallen in 2016. Using poverty line for middle-income countries (\$ 5.5/day in 2011 on on purchasing power parity [PPP]), poverty rate has fallen in 22%, continuing a downward trend that has been present since 2009. It is thought that an increase of employment and wage growth, particularly in the labor force sectors, has contributed to poverty reduction in 2016 and early 2017. In 2015, the country had 447.1 thousand poor people, or 21.5% of the population. About 4.9% of the population live below the poverty line of \$ 1.9/day, while 24.8% of the population live below the \$ 5.5/day poverty line. According to the World Bank's portal (WB, Poverty and Equity, 2017) [16], the consumption growth of the bottom 40% population was only 6.2%. Growth in income at the bottom of the distribution has been stronger than in higher income distribution, for 4.3 percentage points. In fact, this distribution has been the most important in reducing poverty, while economic growth has played a minimal role. Although there is a significant increase, however, the difference in income between the population strata puts Macedonia in the most unequal places in the European Union.

The State Statistical Office of Macedonia, in their report on poverty trends through Laeken indicators (State Statistical Office, 2017b) [17], points out that in 2016 the poverty rate in Macedonia was 21.9%. Analyzed by the type of economy of the household, the poverty rate of households, consisting of two adults with two dependent children was 20.2%. According to the status of economic activity, the poverty rate of employed persons in 2016 was 9%, while for poorer pensioners 7.1%. The measurement of inequality in income distribution, Gini coefficient is 33.6 points.

Table 1. Indicators of Poverty and Social Inclusion in Macedonia in the period 2014-2016.

Poverty and social exclusion indicators, 2014-2016 (final data)			
	2014	2015	2016
At-risk-of-poverty rate, % of population	22.1	21.5	21.9
Number of persons below at-risk-of-poverty threshold, in thousand persons	457.2	445.2	453.2

At-risk-of-poverty threshold of single-person household - annual equivalent income in denars	71 925	78 362	82 560
At-risk-of-poverty threshold of four-person household (2 adults and 2 children aged less than 14) - annual equivalent income in denars	151 043	164 560	173 376
At-risk-of-poverty rate before social transfers and before pensions, % of population	41.7	40.5	41.6
Inequality of income distribution, S80/S20, %	7.2	6.6	6.6
Inequality of income distribution, Gini coefficient, %	35.2	33.7	33.6

Source: The table is processed in Ms.Excel. Data from the Statistical Office of Macedonia, (State Statistical Office, 2017b) [17].

According to the data from the table, we note that in the last three years, the average poverty rate in Macedonia was about 21.8% of the total population. About 453.2 thousand people live below the poverty line, while around 173.376 thousand four-member families live in poverty. The uneven distribution line of income has been downward, so in 2016 it has fallen to 33.6%.

These facts are presented, to prove that there is a high poverty rate in the country, and that there is a need for different economic and social interventions, in order to provide income access and reduction of income inequality for the entire population.

Therefore, we consider that microfinance is a mechanism, which is very necessary to be applied in Macedonia, with the aim of reducing poverty and developing Micro Small and Medium Enterprises. Microfinance and access to finance for the poor, for self-employment and the opportunity of income generation through establishment of small businesses, will be a good and stable solution for the Macedonian population, as it has been proven in other countries in the world.

In Macedonia, microfinance as an economic mechanism is not regulated by a special law. The Law of Banks regulates also the savings houses as one of non-bank financial institutions (deposit receivers). While the Law on Associations and Foundations and the Law on Obligations forms the legal basis for microfinance organizations (not receivers of deposits). The Law on financial companies regulates these companies, as the third type of microfinance providers. The Central Bank is the main institution that supervises savings houses, microfinance institutions and organizations. On the other hand, the Ministry of Finance monitors financial companies. Therefore, taking all into account, we can say that microfinance has not been developed as much as it has been propagated, neither by associations and federations, but also the government, has not created opportunities to develop this financing alternative.

In her study (Hasani V., 2013) [18], emphasizes that microfinance and methods of helping poor businesses and individuals are very necessary for the country. Over the years, some efforts have been made to introduce the microfinance system in Macedonia, to alleviate the situation of small businesses and poor people, but we are witnessing the fact that these efforts have not been successful or have not been properly implemented. Likewise the European Microfinance Network experts report that they have not seen any changes, in terms of legal regulation of microfinance in Macedonia. According to the report, (E.M.N, 2017) [19], although there are no specific legal regulations on microcredit in Macedonia, however, some non-governmental organizations (in the form of associations and foundations), savings houses and financial companies operate on the field of microfinance. According to a study conducted in Macedonia by (Hadzimustafa & Cipusheva, 2013) [20], it turns out that there is a very small number of microfinance studies in the country and the existing ones are only evaluations of some special cases. Their study results that, the percentage of those who have received loans from the MFIs over the past 12 months is very low, i.e. only 2% of the sample. According to the data from the field, in a study by (Idrizi S., 2012) [21], of roma communities, it is noted that the roma in Macedonia are not sufficiently familiar with the possibilities of microfinance services, as an instrument which directly or indirectly can affect poverty reduction and self-employment. Microcredits in Macedonia are provided through banks, savings houses and foundations, which imply the demand for collateral, that poor roma are unable to offer.

II. METHODOLOGY

The researchers of this topic have used different methods, to analyze the impact of microcredit on reducing poverty, increasing the standard of living and narrowing the gap of income. Some authors have used cross sectional analysis, while some have used panel data models with Fixed Effect or with Random Effects. Authors such as (Fattah Sh., 2014) [22], (Bhuiya et.al., 2016) [23], (Imai &Azam, 2012) [24], (Berhane & Gardebroek, 2011) [25], who have had similar samples as our study, have used different models. Based on sample features and based on the models used by researchers of this topic, in this study we will use the Fixed-Effects Regression method on Panel Data.

II.1 Survey preparation

In Macedonia, there is a lack of detailed survey data on the characteristics of the population, which would serve the researchers, to carry out studies that will analyze the correlation of microfinance with poverty, in order to enable the implementation of empirical analysis.

The sample of this paper was generated based on the survey of individuals, but including only those who are household heads or responsible for income and expenditures of the household. The collected data have characteristics of panel-data, which will enable a study of the differences in income and expenditure of households, depending on their characteristics. In the part of the questionnaires, we paid attention to the characteristics of families and household heads. The first part of the questionnaire, which was filled out by the head of the household, included questions about: gender, age, nationality, religion, level of education and occupation of the household head. In the second part, we asked about the characteristics of the households, which included: number of family members, number of children under 15, number of employed family members, monthly incomes and expenditures of the family, property registered in the name of the family. At the same time, in the third part of the questionnaire, we asked questions about access to microcredit, including questions: whether they have received loans in the last 5 years, the amount and purpose of the loan, the duration of the loan repayment, whether the banks have requested collateral for the credits granted, as well as the interest rate.

II.2 Selection and explanation of variables

Based on the purpose of this study, and that is analysis of the impact of microcredit on poverty reduction, income growth and living standards, which have interrelated effects with each-other. Thus, when income increases, it is meant to increase living standards, reduce poverty, increase welfare, and increase consumption. Therefore, the impact of microcredit will be measured through income and living expenditures (consumption).

This is the explanation of variables which show characteristics of the family like: gender, age, nationality, religion, level of education and occupation of the head of household. We assume that this data will have a minimal impact on the microcredit utilization rate. From the aforementioned characteristics, it is assumed that the level of education and occupation of the household head should have high impact on the decision of micro credits for income generation and improvement of well-being.

At the part of explanation of the number of family members, the number of children under 15 (who are dependent on the family), the number of family members who are employed, the monthly income and expenditure of the family, the property registered in the name of family. It is assumed that all these variables have an impact on reducing poverty and increasing welfare. Also, families with the highest number of employed members have more opportunities to generate income, while households with high dependency ratio or dependency ratio are more likely to be poorer and to have income generating problems.

Two groups of households were treated in this study: the first group, those who received micro credits, and the second group, those who did not receive micro credits. In the credits section we have put other variables, such as loan amount, interest rates, property ownership and collateral.

II.3. Descriptive Statistics

From the random sampling results in this analysis, the table below shows that in Macedonia there is no major difference of household management in terms of gender, as about 53% of household heads are male and 45% are female. Also in the analysis of the age aspects, the majority of household heads responding to the survey were younger than 35 years. In terms of religion, we have more answers from the household heads of Muslim religion. From he interviewed heads of households, it is noticed that about 13% of them have primary and secondary education, while 87% have completed advanced secondary education. Of these, a small percent are working in agriculture, while most of them carry out administrative work. Families in Macedonia live in wider communities, so 50% of them have up to 5 members, while 31% of households have up to 3 members, the rest have up to 7 members in the family. On average 47% of households have up to 2 employees, while 42% have up to 2 children under 15 years old.

Regarding microcredit characteristics, the surveyed households showed that around 80% of them have received loans, while on average 64% of them have used microcredits for consumption. In the most of cases, the duration of microcredit treatment lasted about 18 months, while the most frequent interest rate was 5% to 10%.

Table 2. Means, standard deviation and *p-value* of variables (for households treated with microcredit)

Variable	Mean	Std. Dev	p-value
Sex of household head - Male	.53	.49	0.1
Sex of household head - Female	.45	.49	0.6
Age of household head - ageUn35	.45	.47	0.2
Age of household head - ageUn50	.34	.47	0.1
Nationality of household head – NatAl	.53	.50	0.5
Nationality of household head – NatMK	.43	.49	0.5
Religion of household head – RelMu	.57	.49	0.4
Religion of household head – RelOr	.37	.48	0.4
Education of household head – EdPrim	.13	.33	0.1
Profession - ProfFarm	.17	.37	0.1

Profession - ProfAdm	.52	.50	0.1
Family size - Family3	.31	.46	0.0
Family size - Family5	.50	.50	0.0
Dependency ratio - Child2	.42	.49	0.1
Dependency ratio - Child5	.09	0.2	0.1
Emplyment ratio - Empl1	.28	.45	0.1
Emplyment ratio - Empl2	.47	.50	0.1
Emplyment ratio - Empl3	.14	0.35	0.1
Average income of the family - LowIncom	.29	0.39	0.3
Average income of the family -MedIncom	.28	.45	0.0
Average expenditures of the family - LowExp	.26	.36	0.3
Average expenditures of the family - MedExp	.29	.45	0.0
Household head who owns property - ProperY	.46	.49	0.0
Aim of the microcredit - CrCons	.64	.48	0.1
Duration of the microcredit programme - Duration18	.90	.28	0.2
Interest rate of the microcredit - Interest5to10	.47	.50	0.2

Source: Author's calculations based on sample data, in STATA12.

II.4. Model specification

The analysis will be performed using econometric models with fixed-effect regression for panel data. The selection of the model was based on econometric models, used by the authors of the studies in this field, mentioned before. Based on this, the following part contains two econometric models:

$$YI_{it} = \beta_0 + \beta_1 Fit + \beta_2 Cit + \beta_3 Tit + \beta_4 Dit + \mu_{it} \tag{1}$$

$$YE_{it} = \beta_0 + \beta_1 Fit + \beta_2 Cit + \beta_3 Tit + \beta_4 Dit + \mu_{it} \tag{2}$$

YI_{it} – is the dependent variable, which represents the monthly income of the family; YE_{it} – is the dependent variable, which represents the monthly expenditures of the family; F_{it} – is a vector of family characteristics; C_{it} – is a vector of microcredit characteristics; T_{it} – is the duration of micro credit treatment; D_{it} – is the 'dummy' variable that marks with 1 households that have been treated with microcredits; μ_{it} – is the term error that represents variables that are not included in the model; $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$ – are the coefficients to be calculated in the model.

III. RESULTS AND DISCUSSION

Since we are dealing with a study that can be analyzed in two aspects, at first we tested for heteroscedasticity between the random-effect and the fixed-effect model, using the Hausman test, in order to evaluate the most suitable model for this analysis. The test showed a p-value of 0.00 for both models in terms of income and expenditures, thus we can say that I give priority to the fixed-effect model.

From the analysis of the fixed-effect regression model, we have estimated the impact of microcredit on incomes and expenditures of the households, observed on the sample. According to the results we can say that some of the characteristics analyzed in this model have not played any significant role in terms of changing household income or expenses, as a result of micro credit treatment. For example, we see from the table that gender has not made any differences on income, among female headed households. We can see that microcredit has contributed to income growth by 4%, while monthly expenditures have decreased by 8%.

If the head of household is under the age of 30, we see more impact on incomes and expenditures than those with an age up to 50 years. The characteristics of nationality and religion have had no impact on our variables. The level of education has influenced the increase of revenues and expenditures by 11% after treatment with microcredit. The highest impact was observed for the incomes of household heads who work in agriculture and farming, by approximately 19%, while for household heads who work in administrative jobs, a rise by approximately 17%. For households with lower dependency ratio, there was a positive impact on income, while for households with higher dependency ratios, it has shown a negative impact on income and expenditures.

Families which have received microcredits have 2% increase in income, but 1.4% lower living expenditures. On the other hand, households which have not been treated with micro loans have an increase in income and living expenditures. Families that have dedicated their credit for consumption, have had a 9% increase in income and 5% in expenditures, but this does not differ much from the income and expense of households that have not received microcredits. The duration of microcredit treatment, has not shown positive effects on income and living expenditures. The same can be stated about microcredit rates, which have shown negative effects

on income and living expenditures. Thus the results of the study confirmed that microcredit has not shown a significant positive impact on income growth for the families of our sample.

Table 3. The results of econometric models with Fixed-effect regression - household incomes and expenditures.

Treated with Microcredit					Not treated with Microcredit				
Independent variables	Household monthly income		Household monthly expenditures		Independent variables	Household monthly income		Household monthly expenditures	
	Coef.	t test	Coef.	t test		Coef.	t test	Coef.	t test
Female	.04849	0.68	-.08165	-1	Female	.48872	0.68	-.10829	-1.2
AgeUn30	.06871	0.78	.26568	2.7	AgeUn30	.07313	0.81	.26844	2.73
AgeUn50	.01809	0.25	.18617	1.78	AgeUn50	.01769	0.19	.18705	1.79
NatAlb	.17909	1.00	-.21265	-1.12	NatAlb	.17078	1.03	-.21203	-1.2
NatMac	.16871	0.87	-.16125	-0.75	NatMac	.16466	0.87	-.16124	-0.75
RelMus	.15458	0.63	.01468	0.70	RelMus	.11714	0.64	.01551	0.7
RelOrth	.08576	0.55	-.05143	-0.29	RelOrth	.08636	0.56	-.05048	-0.29
EdPrim	.11713	1.00	.11253	0.96	EdPrim	.11489	0.98	.10295	0.77
ProfAdm	.17258	2.40	.0903	1.09	ProfAdm	.17302	2.41	.00917	1.1
ProfFarm	.19905	1.90	.0474	0.4	ProfFarm	.19835	1.89	.00369	0.3
Family3	-.05455	-0.57	.22752	1.89	Family3	-.0574	-0.54	.22652	1.88
Family5	.00596	0.66	.10307	1.03	Family5	.0618	0.71	.10526	1.06
Child2	.05377	0.78	-.09436	-1.17	Child2	-.05649	-0.8	-.0978	-1.21
Child5	-.1512	-1.32	-.12182	-0.89	Child5	-.16201	-1.35	-.12503	-0.9
Empl1	.15522	1.25	-.05572	-0.3	Empl1	.15722	1.26	-.05589	-0.39
Empl2	.0325	0.31	.02181	0.6	Empl2	.03643	0.32	.0229	0.18
Empl3	-.01225	0.23	.08105	0.56	Empl3	-.01530	-0.12	.07938	0.55
ProperYES	-.0318	-0.51	-.02417	-0.48	ProperYES	-.02817	-0.45	.00422	0.6
CreditYES	.02719	0.1	-.14074	-0.98	CreditNO	n/a	n/a	n/a	n/a
CrCons	.0983	0.79	.0553	0.4	CrCons	n/a	n/a	n/a	n/a
Duration	-.20740	-0.92	-.0832	-0.80	Duration	n/a	n/a	n/a	n/a
InterestR	.11553	1.13	-.4355	-1.12	InterestR	n/a	n/a	n/a	n/a
_cons	-.43113	-1.57	.29132	1.03	_cons	-.18234	-0.69	.15066	0.50
F	29.79		0		F	29.83		0	
R squared	0.27		0.23		R squared	0.22		0.23	
Time Effects	Fixed YES		Fixed YES		Time Effects	Fixed YES		Fixed YES	
N	170		170		N	170		170	

Obs	199	199	Obs	199	199
P> t for variables	all 0	0	P> t for variables	all 0	0
Wald chi2(RE)	88.2	59.87	Wald chi2 (RE)	87.77	59.71

Source: Authors calculations, based on the econometric models, in STATA12

IV. CONCLUSIONS

It is proven by many authors that microcredit has had a positive impact on household income and has contributed to poverty reduction, by helping them generate additional financial resources through self-employment and start-up businesses. In fact, income growth, growth of living standards and poverty reduction, have shown cross-cutting effects. So, when income increases, it is meant to increase living standards, reduce poverty, increase welfare, and increase consumption. Therefore, the impact of microcredit is estimated through income and living expenditures (consumption). Given the lack of data from surveys, for Macedonia, the sample of this paper was generated on the basis of a survey. The study was carried out through a Fixed-Effects regression model with panel data. We were able to analyze the changes of income and expenditure of households, depending on their characteristics. The results obtained from the models, with regard to the impact of microcredit in reducing poverty in Macedonia, showed an undesired but expected situation, based on the sample. Within the models, we took into consideration some variables which show the characteristics related to the household head, the household characteristics, and credit-related characteristics also.

Families that have received microcredit have an increase of income, but also a decrease of living expenses. On the other hand, households that have not been treated with microcredit have an increase in income and living expenditures. Households that have used the credit for consumption, have had an increase in income and expenses, but the result is not significantly different from the families who have not used credit. Hereupon, we can conclude that the results of this study confirmed, that microcredit does not have very significant positive impact on income growth and poverty reduction for the families in this study. Thus we say that the level of poverty has remained the same after the use of microcredit, or with minor changes for some families. This may come as a result of a poor financial management of the households, because the financial funds obtained from microcredit, have not been used for income generation. This is confirmed by the fact, that consumption credits are the most common credits of the sample, as we explained on the methodology section. This situation can only change if households become aware and change their objectives, when they have access to microcredit. They must use microcredit to establish start-up businesses, self-employment or other forms for income generation. This study is one of the few studies that have been carried out in Macedonia, and it presents a good empirical basis for future researchers. Of course it opens up the path for new studies by different authors in the future. The next studies should specifically analyze the reasons for this outcome, and provide suggestions, on how microcredit has to be used, in order to increase welfare and reduce the poverty in Macedonia. As a recommendation we can say that a good management of microfinance funds, and a better access to finances for poor people, will be a good and stable solution for the households in Macedonia, same as it has been proven elsewhere in the world. But this will only come to light, if microcredit would be used in order to create self-employment opportunities and generate income, through establishing and development of small businesses owned by the poor households.

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AUTHORS

First Author – Vjolca Hasani Limani Ph.D.c. Faculty of Economy, University of Tetova.

Second Author – Prof. Dr. Seadin Xhaferi, Faculty of Economy, University of Tetova.

Correspondence Author – Vjolca Hasani Limani, vjollca.hasani@unite.edu.mk, vjollcahasani.l@gmail.com

Physicochemical and Sensory Quality Assessment of 'Nono' Sold In Mangu Local Government Area of Plateau State, Nigeria

G. S. Dafur*, C. C. Iheukwumere**, E. T. Azua***

*Postgraduate Student, Department of Microbiology, College of Science, University of Agriculture, Makurdi, Benue State, Nigeria

**Professor & Lecturer, Department of Plant Science, College of Science, University of Agriculture, Makurdi, Benue State, Nigeria

***Senior Lecturer, Department of Plant Science, College of Science, University of Agriculture, Makurdi, Benue State, Nigeria

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Abstract- A study was conducted on 'nono' (locally fermented cow milk) sold in Mangu Local Government Area of Plateau State to assess its physicochemical quality and sensory characteristics. A total of 300 'nono' samples were randomly collected from 10 purposively selected markets in the study area for laboratory assessment. The overall means for temperature, pH, specific gravity (SG), and titratable acidity (TA) were $27.80 \pm 2.90^\circ\text{C}$, 5.78 ± 0.76 , $1.029 \pm 0.01\text{g/ml}$ and $0.186 \pm 0.03\%$ respectively. A significant difference ($P < 0.05$) was established among the means of these variables from the different markets. The overall means for total solids, solids-not-fat, fat, protein, ash and lactose contents of the product were $12.38 \pm 0.66\%$, $8.55 \pm 0.37\%$, $3.83 \pm 0.46\%$, $3.01 \pm 0.27\%$, $0.97 \pm 4.00\%$ and $4.15 \pm 0.27\%$ respectively. A statistically significant difference ($P < 0.05$) was also found among these variables. The overall means for the taste, aroma, colour, appearance and general acceptability of the product were 5.19 ± 3.06 , 5.06 ± 1.16 , 5.18 ± 1.08 , 5.19 ± 1.14 and 5.38 ± 1.09 respectively. The sensory evaluation of the product revealed no statistically significant difference ($P > 0.05$) among the markets. It was concluded that the physical and chemical composition of 'nono' sold in the study area as at the time of this research were within the recommended quality standards of whole milk and milk products.

Index Terms- Assessment, Chemical quality, Nono, physical quality, Sensory quality

I. INTRODUCTION

In Nigeria, locally fermented raw cow milk is known as 'nono' (Makut et al., 2014). Obande and Azua (2013) also viewed nono as a general name used for locally fermented cow milk, and that it is widely consumed in many African countries, including Nigeria. Nono is Nigerian locally fermented milk product commonly prepared by Hausa/Fulani cattle rearers (Adesokan et al., 2011).

Milk and its products such as nono form part of the human diet all over the world. Milk quality continues to be a topic of intense debate in the dairy industry and in medical and public health sectors (Oliver et al., 2009). Production of the best quantities of good quality milk and milk products (nono inclusive) is an important aspect of standard dairy practice

(Maduka et al., 2013). The demand of consumers for safe and high quality milk has placed a significant responsibility on dairy producers, retailers and manufacturers to produce and market safe milk and milk products (Gemetchu et al., 2015). Bhatia et al. (2015) stated that the quality and safety of milk encompasses milk characteristics such as chemical composition, Physical properties, microbiological quality, and sensory properties. This implies that 'nono' with good sensory properties (free from unusual odour, taste, colour, and so on), adequate microbiological status (absence of pathogenic organisms and other microbial contaminants), standard physical properties (such as temperature, specific gravity, pH, titratable acidity, among others), and standard chemical composition (such as total solid fat, solid-not-fat, protein, ash, lactose, among others) can be considered safe and qualitative for human and public consumption.

Physicochemical analysis is an important tool to monitor the quality of milk and their dairy products (Teklemichael et al., 2015). The physical characteristics such as temperature, pH, specific gravity, titratable acidity, among others, as well as the chemical characteristics such as total solid, solids-not-fat, fat, protein, ash and lactose are important parameters in studying the physicochemical compositions of milk (Imran et al., 2008). The acceptability of milk and milk products is also determined by the evaluation of the sensory qualities such as texture, appearance, taste, aroma, colour and overall acceptability (Wakil et al., 2014). The objective of this study is to assess the physical, chemical and sensory characteristics of locally fermented cow milk (nono) sold in Mangu Local Government Area of Plateau State.

II. MATERIALS AND METHODS

The Study Area

This research work was carried out in Mangu Local Government Area of Plateau State, Nigeria (Figure 3). The Local Government is situated in the south Eastern part of the state, and it is one of the local governments that make up the Plateau central senatorial zone. Mangu which lies about 77 kilometers south of Jos, is a semi-urban settlement with a huge farming population. It is located on Latitude $9^\circ 31' \text{N}$ and Longitude $9^\circ 06' \text{E}$. The Local Government has nine (9) districts with a

population of 294,931 people as at 2006 census, and has a land area of 1,653 square kilometers.

Sample Collection

The sample collection method of Ogbonna (2011) was adopted in this study. Nono samples were purchased from ten (10) different markets all within Mangu Local Government Area. Thirty (30) samples were randomly purchased at intervals from nono sellers in each of Mangu market, Pushit market, Kerang market, Ampang market, Panyam market, Gindiri market, Mangun market, Kombun market, Chanso market and Kadunu market. The selection of these markets was based on cattle population, nono hawkers and patronage. The purchased samples were transported to the central diagnostic laboratory of the National Veterinary Research Institute (NVRI) Vom in sterile corked plastic tubes parked in an iced container for physicochemical and sensory properties analyses.

III. DETERMINATION OF PHYSICO-CHEMICAL PROPERTIES OF NONO

Determination of temperature and pH

The temperature of the nono samples was determined at the collection point using thermometer while the pH of the samples were determined in the laboratory using a digital pH-meter as described by Teklemichael et al. (2015).

Determination of specific gravity

Fresh nono sample was filled sufficiently into a glass cylinder (100ml capacity). Then, lactometer was held by the tip and inserted into the nono. The lactometer was allowed to float freely until it reached equilibrium. Then the lactometer reading at the lower meniscus was recorded. At the same time, thermometer was inserted into the nono sample and the temperature of the nono was recorded (Gemechu et al., 2015). The following formula was used to calculate the specific gravity of the nono:

$$\text{Specific gravity} = (L / 1000) + 1$$

Where L = corrected lactometer reading at a given temperature, that is, for every degree above 15.56°C, 0.2 was subtracted from the lactometer reading.

Determination of titratable acidity

Titratable acidity of the nono samples was determined according to the method of the Association of Official Analytical Chemists (AOAC) as described by Gemechu et al. (2015). 9ml of nono sample was pipetted into a beaker and 3 to 5 drops of 1% phenolphthalein indicator was added to it. The nono sample was then titrated with 0.1N NaOH solution until a faint pink color persisted. The titratable acidity, expressed as % lactic acid, was finally calculated using the following formula:

$$\text{Titratable acidity(\%)} = \frac{N/10\text{NaOH (ml)} \times 0.009}{\text{Weight of nono sample}} \times 100$$

Determination of total solids

For the determination of total solids content, fresh nono sample was thoroughly mixed and 5g was transferred to a pre-weighed and dried flat bottom crucible as described by

Teklemichael et al. (2015) and Gemechu et al. (2015). The nono samples were dried in a hot air oven (Model-EDSC made in England) at 102°C for three hours. Finally, the dried samples were taken out of the oven and placed in desiccators to cool at room temperature. Then samples were weighed again and total solid was calculated as:

$$\text{Total Solids (\%)} = \frac{\text{CW} + \text{ODS} - \text{CW}}{\text{Sample weight}} \times 100$$

Where CW = Crucible weight, ODS = Oven dry sample.

Determination of crude protein

Total protein content of the nono samples was determined according to the Kjeldahl method of the Association of Official Analytical Chemists (AOAC) as described by Gemechu et al. (2015) and Teklemichael et al. (2015). For digestion, 5g of nono sample was warmed in a water bath at 38°C and poured into a Kjeldahl flask. A mixture of 15g potassium sulphate, 1ml of copper Sulphate solution and 25ml of concentrated Sulphuric acid was added into the flask and mixed gently. The digestion was carried out in a digestion block until a clear solution appeared. Then, it was allowed to cool at room temperature. The digested solution was diluted with 250ml of distilled water.

For distillation, digestion flask was placed in the distillation equipment. 75ml of 40% sodium hydroxide solution were added into it. Then ammonia was distilled and 50ml of 40% boric acid solution using bromocresol green indicator were added until blue colour appeared. Finally, the sample was titrated with 0.1N hydrochloric acid solution from a burette until a faint pink colour solution was formed and the burette reading was taken to the nearest 0.01ml. Blank test was carried out using the above procedure except that water was used instead of test sample. The percentage of nitrogen in the nono samples were calculated as follows:

$$N (\%) = \frac{(V_s - V_b) \text{HCl consumed} \times \text{NHCl} \times 1.4007}{\text{Sample weight}} \times 100$$

$$CP (\%) = N (\%) \times 6.38$$

Where N (%) = Percentage nitrogen by weight, Vs = Volume of HCl used for titration of sample, Vb = Volume of HCl used for titration of the blank, CP (%) = Percentage of crude protein.

Determination of fat content

Fat content was determined by Gerber method according to Teklemichael et al. (2015) and Gemechu et al. (2015). 11ml of nono sample was mixed with 10ml of commercial sulfuric acid (having a specific gravity of 1.82). The mixture was dispensed into butyrometer and 1ml of amyl alcohol was added into the butyrometer having the sulfuric acid and then closed with rubber cork. After closing the butyrometer using a butyrometer stopper, the content was shaken and inverted several times until the nono sample was completely digested by the acid. Then, the butyrometer was placed in a water bath at 65°C for five minutes. The sample was centrifuged in Gerber centrifuge machine for five minutes at 1100 rpm. Finally the sample was taken back to the water bath at 65°C for 5 minutes and fat percentage was recorded from the butyrometer reading.

Determination of ash content

The ash content of the nono samples was determined gravimetrically according to Gemechu et al. (2015). The dried

nono samples used for determination of total solids content were ignited in a muffle furnace (Model EF5 made in Holland) at a temperature of 550°C until they were free from carbon (heating continued until black colour disappeared or the ash residue appears grayish to white) for four hours, and then the samples were transferred to the desiccators to cool down. Finally, the ash content was calculated according as:

$$\text{Ash content (\%)} = \frac{\text{Residue weight}}{\text{Sample weight}} \times 100$$

Determination of solids-not-fat content

The solids-not-fat (SNF) content of the nono was determined by subtracting the fat percentage from the total solids percentage (Teklemichael et al., 2015; Gemechu et al., 2015) as:

$$\text{SNF content (\%)} = \text{Total solids (\%)} - \text{Fat (\%)}$$

Determination of lactose content

The lactose content was determined by subtracting the fat, protein and total ash percentages from the percentage of the total solids (Gemechu et al., 2015) as:

$$\text{Lactose (\%)} = \% \text{ Total Solids} - (\% \text{ Fat} + \% \text{ Protein} + \% \text{ Total ash})$$

IV. EVALUATION OF SENSORY PROPERTIES OF NONO

The method of Zahraddeen (2006) was adopted for the sensory evaluation of the nono samples collected. A 30 – member panel of sensory judges comprising of students and staff of Federal College of Animal Production and Husbandry NVRI Vom who are familiar with quality attributes of milk and milk products was constituted. Each panelist rated each nono sample three times for taste, aroma, colour, appearance and overall acceptability and the average rating of organoleptic property per nono sample per panelist was determined. The ratings were based on Hedonic scale ranging from 9 representing “Like extremely” to 1 representing “dislike extremely”. Data were classified based on taste, aroma, colour, appearance and overall acceptability for the nono samples.

V. STATISTICAL ANALYSIS

The data obtained for the physical characteristics, chemical characteristics, and sensory properties were subjected to analysis of variance (ANOVA) using the Minitab version 17.0 software to determine differences among the respective characteristics. Significance was determined at 5% probability level.

VI. RESULTS

Mean Values ± Standard Deviation for Chemical Quality of Nono Samples

The mean values (%) for chemical characteristics of nono are presented in table 1. The mean values of Total Solids (TS) ranged between 12.02±0.79 and 12.78±0.47 with an overall mean

value of 12.38±0.66 from the different markets. Solids-not-fat mean values were between 8.45±0.83 and 8.60±0.16 with an overall mean value of 8.55±0.37. Also, the mean values of fat were between 3.56±0.25 and 4.04±0.46 with an overall mean value of 3.83±0.46 from the different markets. That of protein was between 2.85±0.48 and 3.10±0.26 with an overall mean value of 3.01±0.27.

The table also indicates that ash mean values ranged between 0.72±0.07 and 3.07±12.64 with an overall mean value of 0.97±4.00 from the different markets. Whereas lactose mean values were between 4.04±0.17 and 4.33±0.50 with an overall mean value of 4.15±0.27 from the different markets. Furthermore, a statistically significant difference (P<0.05) was established among the mean values of the chemical characteristics of nono samples from the different markets in the study area.

Table 1: Mean values (%) ± standard deviation for Chemical quality of nono samples obtained from different markets in Mangu L.G.A

Variables	Markets										Overall means
	MGU (n=30)	PUSH (n=30)	PAN (n=30)	KER (n=30)	AMP (n=30)	MGN (n=30)	KOM (n=30)	GIN (n=30)	CHAN (n=30)	KAD (n=30)	
TS	12.02 ^a ±0.79	12.22 ^{a±} 0.76	12.53 ^{a±} 0.65	12.28 ^a ±0.73	12.78 ^{a±} 0.47	12.63 ^{a±} 0.59	12.05 ^a ±0.74	12.41 ^a ±0.47	12.31 ^a ±0.40	12.53 [±] 0.56	12.38 [±] 0.66
SNF	8.57 ^{b±} 0.44	8.51 ^{b±} 0.34	8.45 ^{b±} 0.83	8.55 ^{b±} 0.27	8.51 ^{b±} 0.38	8.60 ^{b±} 0.16	8.54 ^{b±} 0.25	8.58 ^{b±} 0.18	8.57 ^{b±} 0.16	8.60 ^{b±} 0.21	8.55 [±] 0.37
Fat	3.97 ^{c±} 0.69	4.04 ^{b±} 0.46	3.90 ^{c±} 0.62	3.98 ^{c±} 0.58	3.79 ^{d±} 0.34	3.56 ^{d±} 0.25	3.74 ^{d±} 0.32	3.86 ^{c±} 0.32	3.67 ^{d±} 0.24	3.76 ^{d±} 0.32	3.83 [±] 0.46
Protein	2.85 ^{b±} 0.48	2.98 ^{b±} 0.26	3.08 ^{d±} 0.23	3.04 ^{d±} 0.20	3.10 ^{d±} 0.26	3.02 ^{d±} 0.32	2.98 ^{b±} 0.20	2.98 ^{b±} 0.20	2.96 ^{b±} 0.17	3.08 ^{d±} 0.17	3.01 [±] 0.27
Ash	0.75 ^{e±} 0.08	3.07 ^{f±} 12.64	0.74 ^{e±} 0.05	0.74 ^{e±} 0.06	0.76 ^{e±} 0.05	0.72 ^{e±} 0.07	0.74 ^{e±} 0.04	0.74 ^{e±} 0.05	0.73 ^{e±} 0.05	0.73 ^{e±} 0.05	0.97 [±] 4.00
Lactose	4.33 ^{a±} 0.50	4.11 ^{d±} 0.27	4.18 ^{d±} 0.21	4.14 ^{d±} 0.23	4.21 ^{a±} 0.21	4.12 ^{d±} 0.21	4.05 ^{c±} 0.19	4.04 ^{c±} 0.17	4.17 ^{d±} 0.22	4.15 ^{d±} 0.25	4.15 [±] 0.27

Means followed by different superscript letters are significantly different (P<0.05) using Tukey Pairwise comparisons test. TS=total solid, SNF=Solid-not-fat; MGU=Mangu, PUSH=Pushit market, PAN= Payam market, KER=Kerang market, AMP=Ampang market, MGN=Mangun market, KOM=Kombun market, GIN=Gindiri market, CHAN=Chanso market, KAD=Kadunu market, n = Number of samples per market.

Mean Values ± Standard Deviation for Physical Quality of Nono Samples

The overall mean values of temperature, pH, specific gravity (SG) and titratable acidity (TTA) from different markets in the study area were 27.80±2.90, 5.78±0.76, 1.029±0.01 and 0.186±0.03 respectively (Table 2). Mean values of temperature (°C) were between 27.10±2.40 and 28.80±2.61 while pH fell between 5.10±0.77 and 6.10±0.65. Also, the mean values of specific gravity (SG) were between 1.025±0.00 and 1.032±0.01 while titratable acidity (TA) fell between 0.180±0.03 and 0.199±0.02 from the different markets. More so, there was a statistically significant difference (P<0.05) among the variables tested from the nono samples obtained from the different markets in the study area (Table 2).

Table 2: Mean values ± standard deviation for physical quality of nono samples obtained from different markets in Mangu L.G.A

Variables	Markets										Overall means
	MGU (n=30)	PUSH (n=30)	PAN (n=30)	KER (n=30)	AMP (n=30)	MGN (n=30)	KOM (n=30)	GIN (n=30)	CHAN (n=30)	KAD (n=30)	
Temp(°C)	28.80 ^a ±2.61	26.67 ^a ±3.85	28.23 ^a ±3.33	27.73 ^a ±3.34	27.10 ^a ±2.40	27.57 ^a ±2.42	28.27 ^a ±2.61	28.43 ^a ±2.84	27.43 ^a ±0.46	27.80 ^a ±2.52	27.80 ±2.90
pH	6.10 ^b ±0.65	5.10 ^b ±0.77	5.60 ^b ±0.64	5.75 ^b ±0.66	5.82 ^b ±0.68	5.97 ^b ±0.68	5.65 ^b ±0.88	5.46 ^b ±0.76	5.73 ^b ±0.84	5.74 ^b ±0.83	5.78 ±0.76
SG	1.029 ^c ±0.01	1.029 ^c ±0.01	1.028 ^c ±0.01	1.025 ^c ±0.00	1.028 ^c ±0.01	1.032 ^c ±0.01	1.030 ^c ±0.01	1.031 ^c ±0.01	1.031 ^c ±0.01	1.032 ^c ±0.01	1.029 ±0.01
TA (%)	0.188 ^c ±0.03	0.188 ^c ±0.03	0.181 ^c ±0.04	0.187 ^c ±0.03	0.188 ^c ±0.03	0.188 ^c ±0.03	0.199 ^c ±0.02	0.184 ^c ±0.03	0.182 ^c ±0.03	0.180 ^c ±0.03	0.186 ±0.03

Means followed by different superscript letters are significantly different (P<0.05) using Tukey pairwise comparisons test. Temp=temperature, pH=Potential of hydrogen (measure of acidity or alkalinity), SG=Specific gravity, TA=titratable acidity, n=number of sample.

Mean Values ± Standard Deviation for Sensory Evaluation of Nono Samples

Table 3 shows that the overall mean values for taste, aroma, colour, appearance and general acceptability of nono samples from the different markets in the study area were 5.19±3.06, 5.06±1.16, 5.18±1.08, 5.19±1.14 and 5.38±1.09 respectively. The results also shows that the nono sampled in the study area were fairly acceptable for public consumption based on their sensory quality. Consequently, no statistically significant difference (P>0.05) was established among the mean values of the sensory characteristics of nono samples from the different markets in the study area.

Table 3: Mean values ± standard deviation for sensory evaluation of nono samples obtained from different markets in Mangu L.G.A

Variables	Markets										Overall means
	MGU (n=30)	PUSH (n=30)	PAN (n=30)	KER (n=30)	AMP (n=30)	MGN (n=30)	KOM (n=30)	GIN (n=30)	CHAN (n=30)	KAD (n=30)	
Taste	6.03± 9.17	4.77± 1.22	5.20± 1.30	5.70± 1.11	5.33± 1.18	5.17± 1.05	5.17± 1.02	4.80± 1.19	5.00± 0.87	5.33± 1.03	5.19± 3.06
Aroma	4.77± 1.46	4.33± 1.42	5.23± 1.14	4.90± 1.27	5.47± 1.04	5.23± 0.97	5.37± 0.96	4.93± 0.94	5.30± 0.95	5.07± 0.94	5.06± 1.16
Colour	4.77± 1.31	4.90± 1.21	5.10± 0.92	5.37± 1.16	5.53± 1.22	5.37± 1.03	5.43± 0.90	5.10± 0.96	5.20± 0.89	5.03± 0.96	5.18± 1.08
Appearance	4.80± 1.16	4.63± 1.40	5.57± 0.94	4.97± 1.25	5.70± 1.09	5.73± 0.98	5.13± 0.94	5.10± 1.23	5.03± 1.00	5.27± 1.02	5.19± 1.14
General Acceptability	4.67± 1.32	4.93± 1.17	5.57± 1.17	5.70± 1.12	5.50± 1.08	5.70± 0.99	5.37± 0.85	5.60± 0.89	5.50± 0.94	5.27± 0.98	5.38± 1.09

Means do not show significant difference (P>0.05). MGU = Mangu, PUSH = Pushit market, PAN= Payam market, KER = Kerang market, AMP=Ampang market, MGN=Mangun market, KOM=Kombun market, GIN=Gindiri market, CHAN = Chanso market, KAD = Kadunu market, n = Number of samples per market.

VII. DISCUSSION

Mean Values for Chemical Quality of Nono Samples

The means of the total solids (TS) content of nono samples collected from the different markets in the study area revealed no statistically significant difference at 5% level of significance. The means of total solids content ranged from 12.02% to 12.78% corresponding to an overall mean of 12.38% (Table 1). The average total solids content (12.38%) recorded in this study is not in line with the findings of Gemechu *et al.* (2015) who recorded an average total solids content of 12.87% higher. The European Union established quality standards for total solids content of cow milk is not to be less than 12.50% (Food and Agricultural Organization/World Health Organization (FAO/WHO), 2007). This implies that the average total solids content of 12.38% of the nono samples in the present study was less than the recommended standards. Different values for total solids content of milk and milk products samples have been reported by different scholars. The variation could be due to difference in breed, feeding and management practices which have important effects on milk composition and quality (Teklemichael *et al.*, 2015).

The overall mean solids-not-fat (SNF) content of the nono samples in the study area was 8.55% with an average mean range of 8.45% to 8.60%. However, the means of the solids-not-fat content of the nono samples from the different markets did not show significant difference at 5% level of significance (Table 1). The overall mean of solids-not-fat content in the present study agrees with the findings of Gemechu *et al.* (2015) but was higher than the findings of Teklemichael *et al.* (2015) who recorded the overall means of 8.59% and 8.00% respectively. Also, the average solids-not-fat content of the nono samples obtained was less than the findings of Bille *et al.* (2009) and Fikrineh *et al.* (2012) who reported higher values of 8.70% and 9.10% respectively from raw cow's milk samples. The differences observed in the solids-not-fat content of milk and milk products could be due to difference in the feeding practices, season, milking method, and lactation period (Gemechu *et al.*, 2015). According to the European Union established quality standards for cow milk and milk products, solids-not-fat content should not be less than 8.50% (Tamime, 2009). Accordingly, the average solids-not-fat content (8.55%) recorded for nono samples in the present were within the recommended standards.

Fat content of nono samples in this study had an overall mean of 3.83% (Table 1). This result was lower than the earlier findings of Fikrineh *et al.* (2012) and Gemechu *et al.* (2015) who reported the fat contents of 5.48% and 4.28% respectively for cow milk samples. The difference might be due to variability among the breeds of cows, within a breed, and stage of lactation (Gemechu *et al.*, 2015). Consequently, fat content of nono samples collected from pushit market was significantly higher ($P < 0.05$) than the fat content of nono samples collected from other markets (Table 9). However, according to the European Union established quality standards for whole milk and milk products, fat content should not be less than 3.5% (Tamime, 2009). This implies that the average fat content of 3.83% obtained in this study was within the recommended standards.

Protein content of nono samples obtained from Panyam, Kerang, Ampang, Mangun and Kadunu markets were significantly higher ($P < 0.05$) than nono samples obtained from the other markets in the study area (Table 1). This difference might be due to variability among the breeds of cows, within a breed, feed, and stage of lactation (Gemachu *et al.* 2015). The overall mean protein content in this study was 3.01% (Table 1). This result obtained is lower than the 3.43% obtained by Gemechu *et al.* (2015) and the 3.48% reported by Abd-Elrahman *et al.* (2009). However, the result almost agrees with the 3.20% lower protein content of milk reported by Mirzadeh (2010). According to the European Union established quality standards for whole milk and milk products, total protein content should not be less than 2.9% (Tamime, 2009). Therefore, the average protein content of 3.01% obtained from nono samples in this study was within the recommended established standards.

The ash content of nono samples collected from Pushit market was significantly higher ($P < 0.05$) than nono samples collected from the other markets (Table 1). The overall mean ash content of 0.97% obtained in this study is higher than the 0.74% recorded by Gemechu *et al.* (2015) and the 0.72% obtained by Teklemichael *et al.* (2015). The ash content of cow milk remains relatively constant between the range of 0.7% to 0.8% (Gemechu *et al.*, 2015 and Teklemichael *et al.*, 2015). The high ash content of 0.97% recorded in the present study could also be due to the breed, stage of lactation, and feed of the animals.

Lactose content of nono samples obtained from Kombun and Gindiri markets are significantly lower ($P < 0.05$) than nono samples collected from the other markets (Table 1). This difference might be due to the action of lactose hydrolyzing enzymes produced by microorganisms as a result of storage temperature variation (Gemechu *et al.*, 2015). The lactose content of nono samples in this current study had an overall mean of 4.15%. This result is lower than the overall mean lactose content of 4.43% recorded by Gemechu *et al.* (2015). According to the European Union established quality standards for whole milk and milk products, lactose content should not be less than 4.2% (Tamime, 2009). This implies that the average lactose content (4.15% which is approximately 4.20%) recorded in this study was within the recommended standards.

Mean Values for Physical Quality of Nono Samples

The pH is the parameter that determines the sample's acidity and alkalinity. The pH values of nono samples collected from different markets in the study area show no significant difference ($P < 0.05$). The mean pH values of the nono samples collected ranges between 5.10 and 6.10 with an overall mean pH of 5.78 (Table 2). This mean range is in disagreement with the pH of fermented milk ranged between 4.17 and 4.80 obtained by Tankoano *et al.* (2016) and 3.84 to 4.48 recorded by Omafuvbe and Enyioha (2011). According to Codex Alimentarius (2004) in Tankoano *et al.* (2016), the pH of fermented milks should not exceed 4.5. However, the mean pH values of nono samples obtained in this study are higher than the recommended value. This implies that the nono in the said area do not meet the standard pH requirement of fermented milks. The mean temperature of nono samples obtained from different markets in the study area shows no statistically significant

difference ($P < 0.05$). The mean temperature ranged between 26.67°C and 28.89°C with an overall mean of 27.80°C (Table 2). This result is not in line with the mean temperature range of 19.67°C - 29.67°C corresponding to overall mean temperature of 22.83°C obtained by Gemechu *et al.* (2015). In this study, the overall mean temperature was 27.80°C. This was higher than the findings of Egwaikhide and Faremi (2010). The industrial Standard recommends for fermented milk products is a holding temperature not higher than 8°C (Omola *et al.*, 2014). In the study area, the lack of cooling system and refrigerator for nono storage might increase the microbial counts. As a result of this, the temperature of the nono samples in the current study was very high. This might be contributed for the increase number of microbial contaminants in the study area.

Specific gravity (SG) of the nono samples ranges from 1.025g/ml to 1.032g/ml corresponding to an overall mean of 1.029g/ml (Table 2). This result is almost in line with the findings of Gemechu *et al.* (2015) who recorded the range of 1.029g/ml to 1.031g/ml with an overall mean of 1.030g/ml. The specific gravity of normal milk ranges from 1.027 – 1.035g/ml with a corresponding mean value of 1.032g/ml (Tamime, 2009). In this current study, specific gravity of nono samples collected from different markets in the study area falls within the range. According to Gemechu *et al.* (2015), the higher value of specific gravity (1.035g/ml) indicates skimming off fat whereas the lower value than normal value of specific gravity of milk (1.020g/ml) is indicative of addition of water. Abebe and Markos (2009) also confirmed that addition of water or other substances changes the specific gravity of milk and milk products. Furthermore, adulteration of milk and milk products with water that was usually done in order to increase the quantity of milk lowers milk's specific gravity while addition of solids such as sugar or flour into milk and removing the butter fat increases the specific gravity of milk beyond 1.035g/ml (Gemechu *et al.*, 2015). The specific gravity is mainly due to the presence of water contents and small concentrations of fats, proteins, vitamins, enzymes and minerals in the sample (Imran *et al.*, 2008).

The mean titratable acidity (TA) obtained in this study show no significant difference ($P < 0.05$) among the nono samples collected from different markets (Table 2). The titratable acidity ranges between 0.180 to 0.199% with an overall mean percentage of 0.186%. This is closely related to the range of 0.163 to 0.213% recorded by Gemechu *et al.* (2015). Normal milk and milk products have an apparent acidity of 0.14 to 0.16% as lactic acid (Teklemichael *et al.*, 2015). This implies that the titratable acidity obtained in this present study is higher than the recommended standard. Asaminew and Eyassu (2011) also reported higher acidity of 0.23 and 0.28% lactic acid for milk and milk products samples in Bahir Dar Zuria District. This might be due to microbial growth and multiplication during transportation of milk and longer storage of the milk before sale or nono production (Gemachu *et al.*, 2015).

Mean Values for Sensory Evaluation of Nono Samples

The sensory evaluation which was conducted on a 9 point Hedonic Scale on taste, aroma, colour, appearance and general acceptability revealed that the nono sold in the study area was relatively of good quality (Table 3). The overall mean values of the organoleptic properties (taste, aroma, colour, appearance and

general acceptability) were 5.19, 5.06, 5.18, 5.19 and 5.38 respectively (Table 3). This result is lower than the rating obtained by Adedayo *et al.* (2013) who recorded 6.63, 7.78, 6.75 and 7.02 for smell, colour, taste and general acceptance respectively in their study. However, there was no statistically significant difference among the properties rated ($P > 0.05$) (Table 3). From the figures obtained, little or no difference exists in all the sensory attributes among the nono samples obtained from the different markets in the study area. Reasons for not rating the nono samples too high by the panelists could be due to the activities of some microorganisms implicated in the product and some physicochemical changes (Wakil *et al.*, 2014).

VIII. CONCLUSION

From the findings of this study, it is concluded that nono produced and marketed in the study area as at the time of this research was not safe for public consumption and can be a source of milk-borne infections since some of the physicochemical qualities evaluated were not within the recommended and acceptable standards. Also, consumption of nono and other milk products made from raw cow milk can result into health problems. This is supported by evidence of changes in some of the physical and chemical properties of the product evaluated.

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AUTHORS

First Author - G. S. Dafur, Postgraduate Student, Department of Microbiology, College of Science, University of Agriculture, Makurdi, Benue State, Nigeria

Second Author - C. C. Iheukwumere, Professor & Lecturer, Department of Plant Science, College of Science, University of Agriculture, Makurdi, Benue State, Nigeria

Third Author - E. T. Azua, Senior Lecturer, Department of Plant Science, College of Science, University of Agriculture, Makurdi, Benue State, Nigeria

Correspondence Author - G. S. Dafur, Postgraduate Student, Department of Microbiology, College of Science, University of Agriculture, Makurdi, Benue State, Nigeria

E-mail:- gsdafur@yahoo.com

Phone Number: - 08032165850

Assessment of Annual Effective Dose Equivalent and Excess Lifetime Cancer Risk Due to Radionuclide Present in Water obtained from Oloru, Kwara State, Nigeria

Akinloye M. K.1, Isola G. A.1 and Ayanlola P. S.

¹Department of Pure and Applied Physics, Ladoke Akintola University of Technology, Ogbomoso, Nigeria

mkakinloye@lautech.edu.ng, gaisola@lautech.edu.ng, apsolar@gmail.com
+2348033575302, +2348033598710, +2348068717301

Corresponding Author: Isola G. A.

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Abstract: *This study was carried out so as to assess the radiological concentrations in water through the use of a well shielded and well calibrated NaI(Tl) detector. Three primordial radionuclides namely ^{238}U , ^{232}Th and ^{40}K were detected in the samples. The radionuclides concentrations range from $2.85 \pm 0.79 \text{ Bq l}^{-1}$ to $25.80 \pm 4.62 \text{ Bq l}^{-1}$ ($11.08 \pm 2.61 \text{ Bq l}^{-1}$) for ^{238}U , from $0.57 \pm 0.06 \text{ Bq l}^{-1}$ to $7.11 \pm 0.66 \text{ Bq l}^{-1}$ ($3.69 \pm 0.34 \text{ Bq l}^{-1}$) for ^{232}Th and from $1.45 \pm 0.14 \text{ Bq l}^{-1}$ to $31.93 \pm 2.42 \text{ Bq l}^{-1}$ ($12.49 \pm 1.05 \text{ Bq l}^{-1}$) for ^{40}K respectively. The average annual effective dose equivalent and excess lifetime cancer risk obtained across the specified age groups are found to be higher than the recommended values for public exposure. It was therefore imperative that appropriate measures be taken to prevent the populace from adverse radiological health implication on the individual that rely on the water for survival.*

Keywords: Effective Dose, Oloru, Radionuclide concentrations, Water.

1 INTRODUCTION

Water, an essential commodity of life, because of its daily consumption and uses. It serves as solvent that promotes chemical activities, transportation medium for nutrients, hormones, enzymes, minerals, nitrogenous waste and respiration gases as well as several other important functions (Akinloye, 2008). The existence of organic matter would have been impossible if not for water, as water is the most abundant element in protoplasm, the essential material of which plants and animals are composed (Donald, 1968). It was reported that, the Earth's surface is covered with about 70% of water, which is estimated at a volume of approximately 1.4 billion km^3 , out of which groundwater occupy about 30%. Water is said to be potable provided it is safe to use for domestic purposes without causing damage to human

health (WHO, 2011). In addition, it must be aesthetically pleasing in regards to appearance, taste and odour. It must also be free of harmful concentrations of chemicals, pathogenic microorganisms and radionuclides.

The distribution of radionuclides in water arise from trace amounts of terrestrial radionuclides, most of which are dissolved solids from rocks, soils and mineral deposits. These radionuclides originate from unstable radioactive atoms that contain excess energy and mass. For these atoms to attain stability, the atoms undergo radioactive decay by releasing the excess energy and mass in form of radiation. Radiation is of health concern to humans because it results in changing the basic makeup of atoms in cells, and more specifically the deoxyribonucleic acid (DNA) molecules inside of cells. However, life has evolved in the

environment with significant level of radiation. (UNSCEAR, 2000; WNA, 2013).

The pathways relevant to the analysis of radionuclides in the environmental materials are external irradiation, inhalation and ingestion (IAEA, 1991). External irradiation comes from radionuclides that are located outside the body majorly from cosmic rays and terrestrial radionuclides that are found in soil and water. Exposures by inhalation occur when humans inhale radioactive gases that are produced by radioactive materials found in the environment (UNSCEAR, 2000). Exposure by ingestion pathway occur when humans swallow or consume radioactive substances. With the exception of inhalation of radon and its progenies that contribute the highest doses to the population, the uptake of radionuclides by ingestion is much higher than that by inhalation (EPA, 2009).

The presence of radionuclides in drinking water can cause human internal exposure which result from the decay of radionuclides taken into the body through ingestion and inhalation (Gorur and Camgoz, 2014). These radionuclides are then distributed within the body organs according to the metabolism of the element involved (Tchokossa *et al.*, 2012). This study was conducted owing to the inability of Oloru community to access potable and treated pipe-borne water, leaving a large percentage of the community to depend majorly on dug wells that are indirect contact with soil. This was observed when carrying out the National Youth Service Corps (NYSC) in the community and its environment. The study will provide a baseline radiological data as there is no record of such in literature.

2 MATERIALS AND METHODS

2.1 Sampling, Preparation and Analysis

Oloru, is located in Moro local government area of Kwara State, Nigeria. It is situated at the west of central region of Nigeria and bounded by latitudes $8^{\circ}27' N$ and $8^{\circ}30' N$ and longitudes $4^{\circ}36' E$ and $4^{\circ}9' E$. The geological formation of

the study area consists of rocks, hill and steeps, and lie entirely within the basement rocks of Nigeria (Rahama, 1988). The study area was group into five locations so as to have good representative sampling of the area, keeping in mind the population density, location of residential areas and schools.

A total of twenty-five water samples were collected across the study area. The water samples were collected from dug wells with different depths ranging from 10 m to 36 m, so as to have a detail record of the study area. At each collection, the water samples were collected at the early hours of the day from the dug wells using manual collection method usually employed by the residence. The water samples were then transferred to 2 liter polypropylene containers that had previously been washed with nitric acid (HNO_3) and distilled water. The samples were then acidified with 11M HCl at the rate of 10 ml per liter so as to prevent adsorption of the radionuclides on the container. The samples were packed in a prepared cylindrical polypropylene container, tightly sealed and kept for a period of 28 days which was a sufficient time required to attain a state of secular radioactive equilibrium between radium isotopes and their respective daughters before their gamma spectrometry.

The radionuclide contents of the water samples were determined using a well calibrated and well shielded NaI(Tl) detector, a product of Canberra, USA. The energy and efficiency calibration of detector was carried out using both the point sources and IAEA-385 standard sediment source. The data acquisition was achieved through a Genie 2k software. Prior to the sample measurement, an empty container of the same geometry as the detector was counted for 36000 s so as to determine the background gamma ray distribution. The sealed samples after attaining a state of secular equilibrium were each placed on the detector for analysis. Samples were counted for the same period of time. The gamma energies used for the estimation of radionuclide concentrations were ^{214}Pb with 352.0 keV ^{214}Bi with 609.3 keV for

^{238}U , ^{208}Tl with 583.2 keV and ^{228}Ac with 911.1 keV for ^{232}Th and ^{40}K at 1460.8 keV. The samples activity concentrations A (Bqkg^{-1}) were determined using Equation 1:

$$A = \frac{C_{\text{net}}}{P_{\gamma} \times \varepsilon \times t \times v} \quad (1)$$

Where C_{net} is the net peak area, P_{γ} is the absolute gamma ray emission probability, ε is the full energy peak efficiency of the detector, t is the counting time, and v is sample volume.

The Minimum Detectable Activity (MDA) for each radionuclide was determined using Equation 2. This is the smallest concentration of radioactivity in a sample that can be detected to a statistical degree level at 95% (Currie, 1968).

$$\text{MDA} = \frac{2.71 + 4.66(\sigma)}{P_{\gamma} \times \varepsilon \times t \times v} \quad (2)$$

Where σ is the standard deviation of the background collected during time t over the energy range of interest, P_{γ} , ε , v and t remain as earlier define.

2.2 Estimation of Radiological Parameters

The annual effective dose equivalent (AEDE) resulting from the ingestion of the radionuclides in the water sample was estimated using Equation 3:

$$\text{AEDE} (\text{mSv} \cdot \text{y}^{-1}) = \sum_i^n (A_i \times W_i \times D_c) \quad (3)$$

Where A_i is the activity concentration (Bq l^{-1}) of each of the radionuclide detected in the water, $W_i(\text{l/y})$ is the annual water intake and D_c (mSvBq^{-1}) is the dose conversion factor for the particular radionuclide. For this study, different age ranges were considered with the consumption rates. The dose conversion factors for the radionuclides detected in the water samples, the annual water intake according to the different age groups were obtained from ICRP (2012).

The excess lifetime cancer risk (ELCR) quantifies the probability of developing cancer over a lifetime at a given exposure level from the ingestion of radionuclides. This was

determined using Equation 4:

$$\text{ELCR} = \text{AEDE} \times D_l \times R_f \quad (4)$$

Where AEDE is in Bq l^{-1} , D_l is the average duration of life (70 y), and R_f is the risk factor (0.05 Sv^{-1}) obtain from ICRP (1990).

3 RESULTS AND DISCUSSION

The radionuclide concentrations for the water samples analyzed are as presented in Table 1. The results show that the radionuclides detected in the water samples belong to the natural terrestrial radionuclides headed by ^{238}U , ^{232}Th series and the singly-occurring radionuclide ^{40}K . It was observed that 14 samples had concentrations below detection limit (BDL) for ^{238}U , 6 samples for ^{232}Th and 2 samples for ^{40}K respectively. The values obtained range from $2.85 \pm 0.79 \text{ Bq l}^{-1}$ to $25.80 \pm 4.62 \text{ Bq l}^{-1}$ with a mean value of $11.08 \pm 2.61 \text{ Bq l}^{-1}$ for ^{238}U , from $0.57 \pm 0.06 \text{ Bq l}^{-1}$ to $7.11 \pm 0.66 \text{ Bq l}^{-1}$ with a mean value of $3.69 \pm 0.34 \text{ Bq l}^{-1}$ for ^{232}Th and from $1.45 \pm 0.14 \text{ Bq l}^{-1}$ to $31.93 \pm 2.42 \text{ Bq l}^{-1}$ with a mean of value $12.49 \pm 1.05 \text{ Bq l}^{-1}$ for ^{40}K respectively. The mean activity concentrations obtained for the radionuclides detected are found to be above than the recommended values of 1.0 Bq l^{-1} , 0.1 Bq l^{-1} and 10.0 Bq l^{-1} for ^{238}U , ^{232}Th and ^{40}K respectively, as the permissible level for drinking water (WHO, 2011). These higher concentrations may be attributed to the direct contact of water with the soil, since the dug wells are not ringed. Therefore, solubility of the soil may have resulted to the higher concentration.

The results obtained for AEDE due to ingestion of radionuclides in the water samples across categories of age are as presented in Table 2. The values of AEDE obtained for the water samples in this work indicate that some of the values are in agreement with the values obtained by Nwankwo (2012) and Nwankwo, (2013) in Kwara State, and these samples values are also in agreement with the results obtained by Ononugbo *et al.*, (2013).

Figure 1 shows the bar chart of the variation

of the mean AEDE obtained in the water samples. The chart indicates that children within the range of 0 – 1 years old are more vulnerable to radiological effect due to their weak immune system and rapid cell growth as the mean AEDE obtained for the age range exceeded 1 mSvy⁻¹ recommended by ICRP (1990). The ELCR due to the ingestion of radionuclides across categories of age in the water samples is presented in Table 3. The values of ELCR obtained are found to be higher than the mean value of 10⁻⁴ (EPA, 2012) and in agreement with the results obtained by Ononugbo *et al.*, (2013). The radiological implication of the higher activity concentrations, AEDE and ELCR obtained for the water sampled may poses a significant health hazards to the community populace that rely on these sampled water for survival when the decay products of the radionuclides ²³⁸U and ²³²Th are ingested.

4 CONCLUSION

This study has further assessed the radionuclide contents in water of Oloru community in Kwara State. A previous report on the determination of radionuclide contents in soil of the same area show that the radionuclides detected occurred with regularity in the soil samples and belongs to the natural radionuclide headed by ²³⁸U, ²³⁵Th and the singly occurring ⁴⁰K (Akinloye *et al.*, 2018). This was attributed to the direct contact of the water by radionuclides from the soil. The contribution of the radionuclides activity concentrations to the AEDE are higher than the tolerable level of 0.1 mSvy⁻¹ and 1 mSvy⁻¹ to the general public for prolonged exposure as recommended by WHO and ICRP for drinking water. Likewise, the contribution of AEDE to ELCR obtained in this report were higher than there commended mean value and this implies that there is the possibility that an individual consuming these water to develop cancer in the future. Therefore, it is imperative the water sources in the study area be given adequate treatment before consumption so as to prevent any adverse health effects.

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Table 1: Radionuclide concentrations in the water sample

Sample Code	²³⁸ U (BqL ⁻¹)	²³² Th (BqL ⁻¹)	⁴⁰ K (BqL ⁻¹)
W ₁	BDL	2.84 ± 0.27	31.93 ± 2.42
W ₂	BDL	4.01 ± 0.35	24.63 ± 2.17
W ₃	10.80 ± 2.85	3.44 ± 0.32	12.71 ± 1.09
W ₄	BDL	BDL	12.93 ± 1.13
W ₅	5.85 ± 1.42	BDL	BDL
W ₆	8.67 ± 3.05	BDL	22.85 ± 1.90
W ₇	BDL	4.44 ± 0.39	3.73 ± 0.32
W ₈	BDL	BDL	1.45 ± 0.14
W ₉	2.85 ± 0.79	4.44 ± 0.41	18.95 ± 1.55
W ₁₀	BDL	4.88 ± 0.46	13.49 ± 1.21
W ₁₁	BDL	5.24 ± 0.49	6.79 ± 0.61
W ₁₂	BDL	5.68 ± 0.52	3.51 ± 0.32
W ₁₃	5.40 ± 1.09	3.44 ± 0.34	8.47 ± 0.70
W ₁₄	16.20 ± 3.99	5.24 ± 0.47	2.84 ± 0.25
W ₁₅	BDL	2.80 ± 0.26	15.49 ± 1.30
W ₁₆	6.75 ± 1.53	2.04 ± 0.19	8.64 ± 0.86
W ₁₇	22.50 ± 5.24	0.80 ± 0.07	10.75 ± 0.92
W ₁₈	25.80 ± 4.62	6.38 ± 0.56	BDL
W ₁₉	BDL	2.47 ± 0.23	1.73 ± 0.15
W ₂₀	6.90 ± 1.50	BDL	29.09 ± 2.24
W ₂₁	BDL	BDL	5.13 ± 0.43
W ₂₂	10.20 ± 2.59	0.57 ± 0.06	15.38 ± 1.27
W ₂₃	BDL	7.11 ± 0.66	19.89 ± 1.55
W ₂₄	BDL	0.80 ± 0.08	14.15 ± 1.29
W ₂₅	BDL	3.41 ± 0.33	2.79 ± 0.25
Range	2.85 ± 0.79 25.80 ± 4.62	0.57 ± 0.06 7.11 ± 0.66	1.45 ± 0.14 31.93 ± 2.42
Mean	11.08 ± 2.61	3.69 ± 0.34	12.49 ± 1.05

MDA for the radionuclides: 0.068 BqL⁻¹ for ²³⁸U, 0.047 BqL⁻¹ for ²³²Th BqL⁻¹ and 0.17 BqL⁻¹ for ⁴⁰K respectively.

Table 2: Annual effective dose equivalent for the water samples across specified age ranges.

Sample Code	Annual Effective Dose Equivalent (mSv ⁻¹)					
	0 - 1 y	1 - 2 y	2 - 7 y	7 - 12 y	12 - 17 y	>17 y
W ₁	1.24 ± 0.11	0.68 ± 0.04	0.50 ± 0.04	0.43 ± 0.04	0.57 ± 0.05	0.62 ± 0.06
W ₂	1.54 ± 0.14	0.39 ± 0.04	0.58 ± 0.05	0.52 ± 0.05	0.71 ± 0.06	0.79 ± 0.07
W ₃	1.54 ± 0.19	1.51 ± 0.36	0.70 ± 0.11	0.66 ± 0.11	1.01 ± 0.17	0.99 ± 0.15
W ₄	0.14 ± 0.01	0.14 ± 0.01	0.08 ± 0.01	0.06 ± 0.01	0.06 ± 0.01	0.06 ± 0.01
W ₅	0.16 ± 0.04	0.69 ± 0.17	0.14 ± 0.03	0.14 ± 0.03	0.24 ± 0.06	0.19 ± 0.05
W ₆	0.48 ± 0.11	1.26 ± 0.38	0.35 ± 0.09	0.31 ± 0.08	0.45 ± 0.13	0.20 ± 0.29
W ₇	1.46 ± 0.13	0.18 ± 0.02	0.49 ± 0.04	0.48 ± 0.04	0.68 ± 0.06	0.76 ± 0.07
W ₈	0.02 ± 0.00	0.02 ± 0.00	0.01 ± 0.00	0.01 ± 0.00	0.01 ± 0.00	0.01 ± 0.00
W ₉	1.70 ± 0.17	0.68 ± 0.12	0.65 ± 0.07	0.61 ± 0.07	0.87 ± 0.09	0.93 ± 0.10
W ₁₀	1.70 ± 0.16	0.30 ± 0.03	0.60 ± 0.06	0.56 ± 0.05	0.79 ± 0.08	0.88 ± 0.08
W ₁₁	1.75 ± 0.16	0.24 ± 0.02	0.59 ± 0.06	0.56 ± 0.05	0.82 ± 0.08	0.91 ± 0.09
W ₁₂	1.85 ± 0.17	0.22 ± 0.02	0.62 ± 0.06	0.59 ± 0.05	0.87 ± 0.08	0.97 ± 0.09
W ₁₃	1.34 ± 0.15	0.83 ± 0.15	0.54 ± 0.06	0.52 ± 0.06	0.77 ± 0.10	0.79 ± 0.10
W ₁₄	2.16 ± 0.27	2.09 ± 0.48	0.96 ± 0.15	0.93 ± 0.14	1.45 ± 0.23	1.43 ± 0.21
W ₁₅	1.06 ± 0.10	0.26 ± 0.02	0.39 ± 0.04	0.34 ± 0.03	0.49 ± 0.05	0.54 ± 0.05
W ₁₆	0.93 ± 0.11	0.95 ± 0.19	0.43 ± 0.06	0.41 ± 0.06	0.62 ± 0.09	0.60 ± 0.09
W ₁₇	1.00 ± 0.18	2.78 ± 0.63	0.69 ± 0.14	0.67 ± 0.14	1.07 ± 0.23	0.92 ± 0.19
W ₁₈	2.76 ± 0.32	3.22 ± 0.56	1.29 ± 0.17	1.26 ± 0.17	1.99 ± 0.27	1.92 ± 0.25
W ₁₉	0.81 ± 0.08	0.10 ± 0.01	0.27 ± 0.03	0.26 ± 0.02	0.38 ± 0.04	0.42 ± 0.04
W ₂₀	0.50 ± 0.07	1.13 ± 0.20	0.35 ± 0.05	0.30 ± 0.05	0.41 ± 0.07	0.36 ± 0.06
W ₂₁	0.05 ± 0.01	0.06 ± 0.01	0.03 ± 0.00	0.02 ± 0.00	0.02 ± 0.00	0.02 ± 0.00
W ₂₂	0.63 ± 0.11	1.34 ± 0.32	0.40 ± 0.07	0.37 ± 0.07	0.57 ± 0.12	0.50 ± 0.10
W ₂₃	2.48 ± 0.22	0.44 ± 0.04	0.87 ± 0.08	0.81 ± 0.07	1.16 ± 0.11	1.28 ± 0.12
W ₂₄	0.40 ± 0.04	0.18 ± 0.02	0.17 ± 0.02	0.15 ± 0.01	0.19 ± 0.02	0.20 ± 0.02
W ₂₅	1.12 ± 0.11	0.13 ± 0.01	0.38 ± 0.04	0.36 ± 0.04	0.52 ± 0.05	0.59 ± 0.06
Range	0.02 ± 0.00 2.76 ± 0.32	0.02 ± 0.00 3.22 ± 0.56	0.01 ± 0.00 1.29 ± 0.17	0.01 ± 0.00 1.26 ± 0.17	0.01 ± 0.00 1.99 ± 0.27	0.01 ± 0.00 1.92 ± 0.25
Mean	1.15 ± 0.13	0.79 ± 0.15	0.48 ± 0.06	0.45 ± 0.06	0.67 ± 0.09	0.68 ± 0.07

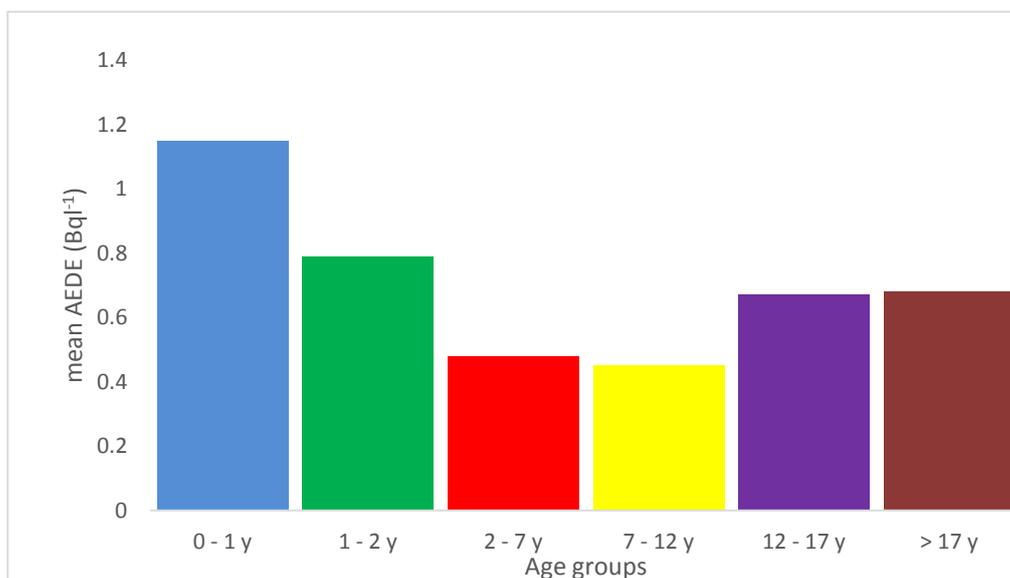


Figure 1: Comparison of AEDE estimated across different age groups

Table 3: Excess Lifetime Cancer Risk of the water samples across specified age range.

Sample Code	Excess Lifetime Cancer Risk ($\times 10^{-3}$ per year)					
	0-1 y	1-2 y	2-7 y	7-12 y	12-17 y	> 17 y
W ₁	4.34 ± 0.39	2.38 ± 0.12	1.75 ± 0.15	1.52 ± 0.13	2.00 ± 0.18	2.17 ± 0.20
W ₂	5.38 ± 0.47	1.38 ± 0.12	2.02 ± 0.18	1.82 ± 0.16	2.50 ± 0.22	2.75 ± 0.24
W ₃	5.37 ± 0.68	5.29 ± 1.24	2.45 ± 0.38	2.32 ± 0.37	3.53 ± 0.59	3.46 ± 0.53
W ₄	0.47 ± 0.04	0.49 ± 0.04	0.28 ± 0.03	0.21 ± 0.02	0.21 ± 0.02	0.21 ± 0.02
W ₅	0.57 ± 0.14	2.40 ± 0.58	0.49 ± 0.12	0.49 ± 0.12	0.82 ± 0.20	0.67 ± 0.17
W ₆	1.68 ± 0.37	4.42 ± 1.32	1.23 ± 0.30	1.09 ± 0.28	1.59 ± 0.46	0.71 ± 0.02
W ₇	5.11 ± 0.45	0.63 ± 0.06	1.72 ± 0.15	1.64 ± 0.14	2.39 ± 0.21	2.67 ± 0.24
W ₈	0.05 ± 0.01	0.06 ± 0.01	0.03 ± 0.00	0.03 ± 0.00	0.03 ± 0.00	0.03 ± 0.00
W ₉	5.95 ± 0.59	2.38 ± 0.43	2.29 ± 0.25	2.12 ± 0.24	3.04 ± 0.33	3.24 ± 0.36
W ₁₀	5.96 ± 0.56	1.05 ± 0.10	2.09 ± 0.20	1.95 ± 0.18	2.78 ± 0.26	3.08 ± 0.29
W ₁₁	6.12 ± 0.57	0.83 ± 0.08	2.08 ± 0.19	1.97 ± 0.19	2.86 ± 0.27	3.19 ± 0.29
W ₁₂	6.49 ± 0.60	0.76 ± 0.07	2.17 ± 0.20	2.07 ± 0.19	3.04 ± 0.28	3.39 ± 0.31
W ₁₃	4.69 ± 0.52	2.91 ± 0.51	1.90 ± 0.23	1.81 ± 0.22	2.70 ± 0.34	2.78 ± 0.34
W ₁₄	7.57 ± 0.93	7.32 ± 1.69	3.35 ± 0.52	3.26 ± 0.50	5.08 ± 0.81	4.99 ± 0.74
W ₁₅	3.70 ± 0.34	0.90 ± 0.08	1.37 ± 0.12	1.24 ± 0.11	1.72 ± 0.16	1.89 ± 0.17
W ₁₆	3.26 ± 0.40	3.32 ± 0.68	1.51 ± 0.22	1.43 ± 0.21	2.16 ± 0.33	2.11 ± 0.30
W ₁₇	3.49 ± 0.63	9.71 ± 2.19	2.42 ± 0.49	2.33 ± 0.48	3.76 ± 0.79	3.23 ± 0.66
W ₁₈	9.67 ± 1.11	11.26 ± 1.95	4.51 ± 0.60	4.42 ± 0.59	6.98 ± 0.95	6.72 ± 0.86
W ₁₉	2.83 ± 0.26	0.34 ± 0.03	0.95 ± 0.09	0.91 ± 0.07	1.32 ± 0.12	1.48 ± 0.14
W ₂₀	1.74 ± 0.23	3.94 ± 0.70	1.22 ± 0.18	1.05 ± 0.16	1.44 ± 0.25	1.25 ± 0.21
W ₂₁	0.19 ± 0.02	0.20 ± 0.02	0.11 ± 0.01	0.08 ± 0.01	0.08 ± 0.01	0.08 ± 0.01
W ₂₂	2.20 ± 0.37	4.83 ± 1.12	1.41 ± 0.25	1.30 ± 0.26	1.98 ± 0.42	1.75 ± 0.35
W ₂₃	8.69 ± 0.80	1.54 ± 0.13	3.05 ± 0.28	2.84 ± 0.26	4.05 ± 0.37	4.49 ± 0.41
W ₂₄	1.41 ± 0.14	0.63 ± 0.06	0.61 ± 0.06	0.51 ± 0.05	0.65 ± 0.06	0.69 ± 0.08
W ₂₅	3.92 ± 0.38	0.48 ± 0.05	1.32 ± 0.13	1.26 ± 0.12	1.83 ± 0.18	2.05 ± 0.20
Range	0.05 ± 0.01	0.06 ± 0.01	0.03 ± 0.00	0.03 ± 0.00	0.03 ± 0.00	0.03 ± 0.00
Mean	4.03 ± 0.44	2.78 ± 0.28	2.09 ± 0.21	1.59 ± 0.20	2.34 ± 0.31	2.39 ± 0.30

Attitudes of Physical Fitness among Girl Students in Nepal

Suresh Jang Shahi

* Physical Education Department, University Campus, Tribhuvan University
Kirtipur, Nepal (shahi.suresh123@gmail.com)

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Abstract- This study presents a comparative analysis of attitudes on physical fitness among the girl students in private and government campus, Nepal. Initially, it was hypothesized that there is no significance difference in attitude of physical fitness between the girl students of two different campuses. From among two hundred girl students of the campuses 100 students from each campus were purposively selected. A five point Likert-type scale was applied for data collection from the selected students who participated in practical examination. There were 10 positive and 10 negative opinion statements; altogether 20 opinion statements were used for data collection. It was found that all respondents showed positive attitudes towards physical fitness. In comparison to government campus students, the private campus students were more favorable towards physical fitness. In order to test whether there is significant difference in score between the girls of two campuses the t-test score was applied as statistical test at the 0.05 level of significance. The t-test was significant in both positive ($p=0.015 < \alpha=0.05$) and negative ($p=0.022 < \alpha=0.05$) statements at 0.05 level of significance. It is enough evidence in the data to reject null hypothesis; there is no difference between the attitude of physical fitness score between the girls of two campuses; the private and government campus. Therefore, there is significant difference between attitudes of physical fitness score between the girls of two campuses. The difference is due to the participation of private campus girl students more in sporting activities than government campus girl students.

Index Terms- Physical fitness, sporting activities, positive and negative attitude, favorable and total Score

I. INTRODUCTION

Physical fitness has been defined in various ways. Someone defines it as absence of disease, and someone rate this according to the total amount of muscular development, and few define physical fitness as ability to perform certain sport skills. The most comprehensive definition defines physical fitness as the measure of the body's strength, endurance and flexibility (Uppal et al., 2005). Physical fitness enables us to perform up to our potential. Fitness can be described as condition that helps us for better look, pleasant feel and do our best. Physical fitness refers to the organic capacity of the individual to perform the normal task of daily living without undue tiredness or fatigue having reserves of strength and energy available to meet satisfactory any emergency demands suddenly placed upon him.

Physical fitness involves the performance of heart and lungs, and the muscles of the body. By improving the basic components of physical fitness such as endurance, strength, flexibility, speed, and agility (co-operative ability) one can develop physical fitness. These elements can be developed through different means/methods of training (Singh, et al., 2012). Agility, balance, body composition, cardio-vascular endurance, co-ordination, flexibility, muscular endurance, muscular strength, power, reaction time, and speed are the components of physical fitness (Shahi, 2015). Physical fitness is some general athletic terms, means the capability of the individual to meet the varied physical demand made by a sporting activity as well as regular exercise, without reducing the person to an excessively fatigued state. The fitness can be developed through sporting activity or regular exercise e.g. walking, jogging swimming, cycling, playing sports on regular basis (Davis et al., 2000).

Dhanusa district, a part of state number 2, is one of the seventy-seven districts of Nepal, a landlocked country of South Asia. Janakpur is a headquarters of Dhanusa district and state number 2. Dhanusa lies in the southern part of Nepal, which is called plain area and Terai belt. It has mixed habitation of different cast and ethnicity. This district has the highest density of Maithili population in the country. Maithili people are under the Hindu religion. This study was enclosed in girl students within Maithili community. In Maithili cultures, girls have not got opportunity to participate in sports and exercise or fitness activity. We know that people can develop their physical fitness through exercise and sporting activity. Maithili community is more religious, traditional, intolerant and narrow-minded for both girls and women. Maithili society and their social acceptance does not allow girls to get chance to take part in extra sports and fitness activities even their leisure time. The information media like internet, television, magazines, newspaper and sports environment of campus were the main source of physical fitness knowledge and attitude of people. Therefore, the objective of this paper was formulated based on this statement. The world have indicated more attention and deliberation toward fitness activities ever since they started suffering from disease like heart disease, diabetes, blood pressure, obesity and other bodily incapacities which normally occur due to the lack of physical fitness activities. People who involve in sports activities should have better attitude. Thus, this research paper was stated as "Attitude of Physical Fitness among the Girl Students of Nepal".

II. OBJECTIVES

The objective of this paper was to compare and analyze the attitude of physical fitness between the girl students of private and government campus.

Hypothesis

H0: There is no difference between the attitude of physical fitness score between the girl students of private and government campus.

H1: There is difference between the attitude of physical fitness score between the girl students of private and public campus.

III. METHODOLOGY AND TOOLS

This research paper was based on descriptive cum quantitative in comparative nature (Best & Khan, 2002). The Nepalese girl students, who were studying in bachelor level of health and physical education at Janakpur city of Dhanusa district, were the population for this research paper. For this research paper, girl respondents were taken within Maithili community. Thus, the data was collected through convenient cum purposive sampling method. For this purpose, Ramsworup Ramsagar multiple campus and Rajarshi Janak Campus were involved. The Ramsworup Ramsagar multiple campus is a government campus and another is a private campus. The research campuses and students were selected conveniently, who were participating in practical examination of Tribhuvan University, Nepal. The respondent number of 100 students was selected from each campus through purposively so that the sample size was delimited within 200 girl students. For this purpose, primary sources of data were only included.

Tools: For this study, a five point Likerts-type scale (Johnson & Nelson, 1988) was applied as the main tool of data

collection. There was applied multi-stage sampling method. Altogether 20 statements were tested whereas 10 were positive and 10 were negative (Neure, 2014). The raw data from these statements were compared. Mean, standard deviation and coefficient of variations were the key technique of data analysis. In addition, the p-value of t-test of difference of means test was applied at α which was assigned as 0.05 level of significance (Shahi, 2016). The data were collected on the basis of following table.

Table 1: A five Point Likert-type Scale for Measuring the Attitude Level

Alternatives	Positive Statements	Negative Statements
Strongly Agree (SA)	5	1
Agree (A)	4	2
Undecided (U)	3	3
Disagree (D)	2	4
Strongly Disagree	1	5

IV. RESULTS AND DISCUSSION

The result and discussion through the scores of opinion statements in the different topics are as follows:

4.1 Attitude of Respondents towards Positive Opinion Statements

Through the Likert-type for attitude scales, when the statement is positive then scoring is indicated in descending order: 5, 4, 3, 2, and 1 for SA, A, U, D and SD, respectively. There were given 10 positive statements to put their own opinion upon 200 students. And they selected the mentioned options which carry different levels of their attitudinal scores. Table 2 summarizes the scores of positive opinions of the respondents.

Table 2: Attitude of Summative Score of Positive Opinion

Respondents	Statements	Purposed Attitude Score					Score	Decision	Conclusion
		SA	A	U	D	SD			
Private Students (100)	10	5000	4000	3000	2000	1000	4530	4530>3000 (favorable score)	Positive Attitude
Government Students (100)	10	5000	4000	3000	2000	1000	4150	4150>3000 (favorable score)	Positive Attitude
Total (200)	10	10000	8000	6000	4000	2000	8680	8680>6000 (favorable score)	Positive Attitude

Table 2 shows this paper included 200 girl students. There were 10 positive statements administrated among them. According to the Likert-type opinionative rating scale, if there were 5000, 4000, 3000, 2000 and 1000 or less scores then it would show the most favorable, positive, neutral (neither positive nor negative),

negative and most negative attitude of girl students respectively. Likewise, if there were 10000, 8000, 6000, 4000 and 2000 or less scores then it would show the most favorable, positive, neutral, negative and most negative attitude of girl students respectively. In other words, if the scores of attitudes seen greater than neutral

score or tended to negative (-ve) direction in scale, this means result is known as favorable or positive tendency. Furthermore, if the scores of attitudes are seen less than neutral score or tended to positive (+ve) direction in scale, this means result is known as favorable or positive tendency, this case in positive statements only (Shahi, 2017). In above Table 2, 4530 attitudes' score was from 100 private campus students and 4150 score from 100 government campus students employing 10 positive statements upon them which seem to be higher than 3000. Hence, these scores show the favorable scores for positive attitude. This means, both groups of respondents had shown positive attitude towards the physical fitness. In other words, the attitudes' score of private campus students had higher than government campus

students (4530 > 4150) towards physical fitness. We obtained 8680 scores from total 200 respondents employing 10 positive statements upon them which seem to be significantly higher than 6000. Hence, this score show the favorable score for positive attitude. This means, total respondents had shown positive attitude towards the sports. Comparatively, the total opinion raw score of private campus students was found slightly greater than government campus students. This result was favored through sports' environment of campus and family.

Statistical Analysis: The statistical summary of the raw score data on attitudes on 10 positive statements are presented in the following Table 3:

Table 3: Comparative analysis of standard scores among girl student groups of positive statements

Statistics	Private Students	Government Students
Mean	453	415
Standard Error	5.96	10.32
Standard Deviation	18.9	32.6
Range	42	108
Minimum	434	336
Maximum	476	444
Coefficient of variation (%)	4.2	7.9
p-value of t-test (at $\alpha = 0.05$)	0.015	
Conclusion	Significant ($p < \alpha$)	

Table 3 shows that the mean score of private campus students' attitude (453) is greater than government campus students (415). Likewise, range of score difference between maximum and minimum, standard deviation and coefficient of variation of private campus students are less than government students. The higher score of standard deviation indicate that the individual score is more dispersed from mean and also the higher value of coefficient of variation indicates that there is wider dispersion in each individual score. If the value of range, standard deviation and coefficient of variation are lower score, we know that the lower score is better than higher score. This means, the group of private campus students was better in attitude than government

group. Furthermore, p-value of t-test score of two types of campuses is 0.015 which is less than 0.05 ($p < \alpha$) at 95 percent confidence interval. Hence, it is enough evidence in the data to reject null hypothesis. Therefore, there is significant difference between attitudes of physical fitness score between the girls of two campuses. The reason behind it was that private campus students were more involved in jogging, walking, cycling, playing sports and sporting activities also.

4.2 Attitude of Respondents towards Negative Opinion Statements

Table 4: Attitude of Summative Score of Negative Opinion

Respondents	Statements	Purposed Attitude Score					Score	Decision	Conclusion
		SA	A	U	D	SD			
Private Students (100)	10	1000	2000	3000	4000	5000	3649	3649>3000 (favorable score)	Positive Attitude
Government Students (100)	10	1000	2000	3000	4000	5000	3137	3137>3000 (favorable score)	Positive Attitude
Total (200)	10	2000	4000	6000	8000	10000	6786	6786>6000 (favorable score)	Positive Attitude

Through the Likert-type of attitude scales, when the statement is a negative then scoring is indicated ascending orders 1, 2, 3, 4 and 5 for SA, A, U, D and SD respectively. There were given 10 negative statements to put their own opinion upon 200 students. And they selected the mentioned options which carry different levels of their attitudinal scores.

Table 4 shows this research paper included 200 girl students. There were 10 negative statements administrated among them. According to the Likert-type negative opinionative rating scale, if there were 1000 or less, 2000, 3000, 4000 and 5000 scores then it would show the most negative, negative, neutral (neither positive nor negative), positive and most positive attitude of students respectively. Likewise, if there were 2000 or less, 4000, 6000, 8000 and 10000 scores then it would show the most negative, negative, neutral (neither positive nor negative), positive and most positive attitude of students respectively. In other words, if the scores of attitudes are seen greater than neutral score or tended to positive (+ve) direction in scale, this means result is known as favorable or positive tendency. Furthermore, if the scores of attitudes are seen less than neutral score or tended to negative (-ve) direction in scale, this means result is known as favorable or positive tendency only in positive

statements case. In above Table 4, 3649 and 3137 attitude scores were obtained by private and government campus students, respectively. These scores were from 100 students from each campus which seem to be higher than neutral score 3000. Hence, these scores show the favorable or positive scores in this attitude scale. This means, both groups of students had shown positive attitude towards physical fitness. From the data of Table 4, the attitude score of private was higher than government campus students towards physical fitness. Furthermore, 6786 attitude score was obtained from total 200 students from both campuses which seem to be higher than neutral score 6000. Hence, this score show the favorable or positive score in this attitude scale. It means the total respondents had shown positive attitude towards the physical fitness. However, it is concluded that the total opinion score of private was found slightly greater than government campus students. The difference is due to the private campus girl students has more family support to involve on sports.

Statistical Analysis: The statistical summary of the raw score data on attitudes on 10 negative statements are presented in the following Table 5:

Table 5: Comparative analysis of standard scores among girl student groups of negative statements

Statistics	Private Students	Government Students
Mean	364.9	313.7
Standard Error	13.0	16.8
Standard Deviation	41.0	53.0
Range	142	175
Minimum	296	175
Maximum	438	350
Coefficient of variation (%)	11.2	16.9
p-value of t-test (at $\alpha = 0.05$)	0.022	
Conclusion	Significant ($p < \alpha$)	

Table 5 shows that mean score of private campus students' attitude (364.9) is greater than government campus students (313.7). Likewise, range of score difference between maximum and minimum, standard deviation and coefficient of variation of private campus students are less than government students. The higher score of standard deviation indicate that the individual score is more dispersed from mean and also the higher value of coefficient of variation indicates that there is wider dispersion in each individual score. If the value of range, standard deviation and coefficient of variation are lower value, we considered that the result is better than higher. This means, the group of private campus students was better in attitude than government group. Furthermore, p-value of t-test score of two types of campuses is 0.022 which is less than 0.05 ($p < \alpha$) at 95 percent confidence interval. Hence, null hypothesis of the paper is rejected. In other words, alternative hypothesis is accepted. Therefore, there is significant difference between attitudes of physical fitness score

between the girls of two campuses. The information media like television, radio, booklets, magazines, newspaper, internet and sporting environment as well as regular attendance in campus were the main source of knowledge. These sources has played crucial role to affect their attitude. Moreover, the private campus girl students have participated more in sporting activities than government campus girl students. This factor has favored the result.

V. CONCLUSION

This research paper was found to have favorable score or positive opinion through both groups of girl students in positive and negative statements. Comparatively, it is concluded that the total opinion score of attitude of private campus students was found greater than government campus students. Applying the t-test score at both campuses, p- values were less than α in positive (p

= $0.015 < \alpha = 0.05$) and negative ($p = 0.022 < \alpha = 0.05$) statistical test at 0.05 level of significance and 95 percent confidence interval. Hence, there was found significance difference in the attitude of physical fitness between the private and government campus girl students. Hence, null hypothesis of the paper was rejected. This means alternative hypothesis is accepted. The difference is due to the participation of private campus girl students more in sporting activities than government campus girl students. The information media like television, radio, booklets, magazines, newspaper, internet and sporting environment as well as regular attendance in campus were the main source of knowledge. This factor has favored the result. For the extension of the existing knowledge, perception, attitude related programs and intramural cum extramural sports' meet should be conducted in all educational institutions of Nepal. This type of research should be conducted in research area to increase the expansion of students' attitude towards sports as well as fitness. Society should provide support for their children to take part in sporting activities. Sports instructor or teacher should be managed in campuses of Nepal by administrative side. This research suggests that the religious, socio-cultural and traditional norms and value as well as thought of Maithili community should motivate in sports activities through positive way. The content of the sports should be included in school curriculum.

[10]

The ministry of education of Nepal should include the subject of sports in all level as compulsory subject.

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Application of Brick as a Building Material for Low Cost Housing in Hot and Dry Climates.

Laban Shihembetsa*, Etta Madete**

*Department of Architecture and Building Science, School of the Built Environment, University of Nairobi

**Department of Architecture and Building Science, School of the Built Environment, University of Nairobi

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Abstract- Brick which is a by-product of clay soils can be found in the historical architecture of any civilization due to its affordability, accessibility, recyclability and social cultural connections especially in the hot-dry climates of the world. Its popularity as a construction material is still evident today with over a third of the global population currently living in earthen structures. Yet low cost housing provision, especially in developing countries is plagued by the ever increasing cost of building systems (technology, materials, transport, labour, etc.) and high demand for affordable housing for the low-income group. This paper examines sun dried and burnt brick production and construction technology through a study conducted in Kenya and Morocco in 2016 and 2017 respectively whose main objective was to examine the application of brick (sun-dried and burnt) in both the traditional and contemporary approaches in the hot and dry climates by using two case studies of Voi in Kenya and Tamnougalt town in Morocco. The study employed both qualitative and quantitative research methods (through case study method and structured questionnaire, discussions and observations) to collect information and data for analysis and presentation. The study findings show that in Voi, Kenya, the quality of burnt bricks produced is low which has led to high defects cases in buildings; while in Tamnought (Morocco), sun dried bricks are predominantly used with indication that more and more conventional imported materials (concrete, clay bricks, steel, etc) are being used.

Index Terms: Burnt brick/sun-dried bricks/building technology/ low cost housing.

I. INTRODUCTION

The 2005 report by the UN estimated that 100 million people are homeless worldwide and 1.6 billion lack adequate housing (Habitat, 2014). Housing as basic need outranks health and education and is a key developmental agenda for most successive governments. The housing crisis is evident across Africa as the continents growing population gets urbanized and is predicted to reach 25% of the worlds' urban population by 2050. This rapid urbanization and growth comes with its advantages such as a thriving work force, bustling commercial and economic sector. However the disadvantages are a rising demand on housing. A dire example is that of Nigeria with a population of 173 Million with a back log of 17 million units with 700, 000 additional units demanded each year. At present the housing sector is only providing 100 00 units (CAHF, July 2017). The latest statistics from the National Housing Corporation (NHC) in Kenya show that the country has a cumulative housing deficit of 2 million housing units, which grows by 200,000 units annually. Of the houses that are actually built 83% are for high and middle income earners, 15% for lower middle income and 2 % for low income segment (World Bank Group, 2017). The key constraints to affordable housing provision include high land values, high cost of materials and unaffordable mortgages. One of the key agendas for the Kenyan government has been affordable housing and the target sits as 1 million homes in 5 years. To do this the key component is embracing affordable, accessible and sustainable building technologies and materials in order to reduce the cost of construction and further reduce the price of the unit.

With this high demand for shelter the appropriate response to construction is to use locally available materials with simple construction techniques. Hence the use of appropriate building materials is a vital sustainable design strategy, especially in hot and dry climates where thermal comfort is key but hard to achieve. In these areas mud brick is the most affordable, available, climatically and contextually a suitable construction material. It is noteworthy that, the

cost of building materials is the largest single input in construction (accounting for 55%-65% of the total cost) yet in early days in Africa, traditional houses were built with materials sourced from the immediate environment and built with relatively inexpensive and simple technology. (G.Fa Y. A., 2012). The key constraints in embracing more affordable techniques in housing provision include a lack of government policy on their standardization and use, lack of confidence in the funding organizations due to minimal research in local building materials, social biases against the material, complicated machinery and technology not transferred to the local population, inertia in the building industry due to lack of information. Brick in hot-dry climates has been and still is a popular sustainable construction material choice due to its affordability, accessibility, recyclability and low embodied energy. Earth structures built over 100 years ago are still standing today proving the materials potential to be sustainable, durable, thermally comfortable and having little to no carbon footprint. (Ugochukwu, 2016). The key advantages of Brick are its: Availability - earth is a natural occurring source and if harvested properly and prepared well can be used for construction with little to no additional reinforcement. Affordability - the highest component of high cost of materials in construction is due to the high cost of importation. Energy efficiency - due to reduction in operation, importation, transport and inherent thermal comfort (Ugochukwu, 2016). The key Challenges facing adoption of brick are: Acceptability - due to its perception as a material for the 'poor' and substandard material. Durability and strength - brick performs best under compressive strength and requires external finish to protect it from natural elements. Building tall - the limitation in strength of brick counteract against very high structures unless with a timber floor system as was used traditionally in order to reduce the weight of the structure. Deforestation - this is in the case of burnt bricks which are produced in furnaces fueled by timber.

Brick can be found in the historical architecture of any civilization and each society had their own version of brick production and construction technology. Earth has been used to create shelter since Neolithic times and the earliest evidence of it can be traced back to Egypt in the pre-dynastic civilization. Initially it was simple method of wattle and daub which in the 1st dynasty turned to brick construction (Shaw, 2000). Climate control was key in traditional brick architecture in hot dry climates, so buildings had high windows, dark rooms, and rooftop sleeping areas. Walls were white washed plastered for heat reflection. The soil composition used was a mixture of coarse sand for strength, and clay for binding. Rising from the Egyptian dynasties, the use of brick spread east ward with the Great Wall of China built entirely of burnt and sundried brick (in 210 BC) and northwards to the Roman Empire. It spread throughout Europe especially during the fires that ravaged medieval cities in the 15th century as it was more fire resistant than wood. Finally reaching the Americas through Coptic traveller in the 16th century with the Dutch west India Company being the first brick building, in Manhattan Island in 1633. Historically the brick production process involved kneading the mixture after which it was left overnight, then the bricks were formed with a timber mould and left to dry in the sun. Drying time varied from a couple of hours to a week and in some cases the bricks were left to dry when already on the structure. Brick making was a craft passed down through generation of skilled masons and moved from northern Africa to West Africa due to the popular trade routes through the Sahara Desert. One great example is the largest earth structure standing today; the great Mosque of Djenné in Mali completed in 1907. Historical research reveal that ancient Egyptians predominantly used sun dried bricks leaving burnt bricks to pavings in palaces and wealthy homes due to fear of fire and the high expense of fuel (Capaldi, 2011). In contemporary times the works of Hassan Fathy in Egypt demonstrate the far reaching benefits of earth as a building material for low cost housing and community projects. These benefits were demonstrated in his projects such as New Gourna in Luxor and New Baris Village in Kharga and documented in his ground breaking book, "Architecture for the poor" (1973), where he advocates for decent housing for the poor. Beyond that, Hassan Fathy favoured earth not only for its cost but also for its intrinsic human values and cultural connections (Fathy, 1986). Throughout time the brick production process consists of four stages namely soil selection, mixing process, brick formation and brick drying. The methods vary depending on location, climate, soil composition, economy and availability of resources and tools. The brickyards are usually set up along river banks to take advantage of the rich soil from river deposits and the easy access to water and transport. Each technique has its advantages and disadvantages, for example despite the low energy consumption of sun dried bricks, the drying area required is vast which is not practical in some projects.

A. Earth and brick construction technology

Earth is formed from erosion of rock and the chemical reactions of oxygen and plant material therefore the composition and properties of earth depends on where it is found. It is important to know the soil composition of an area before attempting construction because these properties determine the most appropriate method of construction. For example mountainous earth which has high gravel content is better for rammed earth construction as seen in the traditional building techniques of German brick houses. Soil used for construction should be relatively free from organic material with the exception of dry plant (straw) and animal waste (cow dung) to strengthen the brick. For

construction it is highly recommended that there is adequate clay as it acts as the internal binder. Brick construction technology changes by location, culture and climate and is often passed down through generations by craftsmen. Apart from walling, traditionally timber framed brick structure used rammed earth floor systems. This was the most affordable method for floor construction; however, this took a long time to dry. In palaces, public walkways and temples the vaulted earth floors were sometimes used. Brick bonding is the way the bricks are laid on a wall construction. This affects the walls structural strength, dimensions and appearance. Typical brick dimensions are 230mm x 110mm x 76 mm but this varies with the mould used and where the brick will be used. The four main bonding types; the stretcher bond, header bond, flemish bond and english bond are used in the brick construction without exception. In hot-dry climates brick can be used to create pitched, flat and vaulted roofs. Vaults and domes are low cost because they do not rely on timber or concrete for structural support. Traditionally earth was used for roofing but faced challenges of water proofing and was replaced by brick roofing tiles which also made the roof more durable and strong for walking on if need arises (Gernot, 2006).

B.Improving the performance of brick through stabilization

In order for bricks, especially sun-dried to perform well, they require stabilization for strength (compressive and tensile) and moisture control. Stabilizers can be added in the initial mixture or as surface protection in order to improve its performance in compressive and tensile strength, shrinking and swelling and its resistance to rain and wind erosion. The three main soil stabilisation techniques are soil compaction, fibre reinforcement and addition of cement, lime or bitumen (Guillard, 1994). The performance of the chosen stabiliser depends on the soil composition and should be tested through in-situ experimentation. The three main objectives for soil stabilisation are reducing porosity, filling the voids to reduce permeability and improving grain bonding. International Centre for Earth Construction (CRATerre) has three classifications namely mechanical stabilisation through compaction, physical stabilisation through texture and structure modification and chemical stabilisation through physio-chemical reaction (www.craterre.org). Soil stabilisation is unsustainable because it is an added cost, increases construction period and processes and not entirely necessary in low rise developments (1 to 3 floors). The main reason to use soil stabilisation is due to extreme site requirements (heavy rains and poor soils) and for increasing its strength in high rise developments. Fibres have played a key role in soil stabilisation for centuries. Ancient Egyptians weren't known for direct stabilisation of the earth mixture but instead whilst harvesting ensured that the stems of the stalk remained so that the soil already contained dried organic materials. The three main fibres used for construction include plant fibres (listed below), animal fibres such as fur and hair and synthetic fibres such as steel, cellophane, glass and wool fibres. Plant fibres constitute the larger portion and include straw (barley, rye, wheat and lavender), chaff off cereals, sawdust, shavings, hay, sisal, manila, grass, hemp, millet, cane, bagasse, bamboo and hibiscus. It is important to keep the fibres dry otherwise it will decompose. Fibre improves soil construction performance in four ways - by reducing cracking, by distributing the tension created by shrinkage and accelerating drying, by increasing internal drainage and thus reduce density therefore increasing insulation and by increasing tensile and compressive strength. Natural stabilisers are also popular and these cover all animal, vegetable and mineral products. Animal products used for stabilisation include manure, urine, blood, fur, hair, casein (milk), glues, oils and fats (water proofing). Vegetable products include ashes, oils and fats such as castor, coconut, linseed etc. Mineral products are mainly to improve the grain distribution of the soils like adding clay to sandy soil and vice versa.

II. THE STUDY APPROACH

A. Objectives

The main objective of the study was to examine the production and application processes of brick (both sun-dried and burnt) in both the traditional and contemporary approaches in the hot and dry climates by using two case studies of Voi in Kenya and Tamnougalt town in Morocco and come up with recommendations on . In order to meet this objective, the study examined how sun dried and burnt bricks production and construction technology is applied through a study conducted in Kenya and Morocco in 2016 and 2017 respectively.

B. The study area

Hot semi-arid climates (type "BSh- Koppen classification") where this study was conducted tend to be located in the 20^o and 30^o latitudes (i.e., in the tropics and subtropics), typically in close proximity to regions with a tropical savanna climate or a humid subtropical climate. These climates tend to have hot summers and warm to cool winters, with some minimal precipitation and are most commonly found around the fringes of subtropical deserts. The case study locations were decided using non-random purposive methods which means that they were selected on the

basis of what will provide the best data to achieve the stated research objective (Kumar, 2005). The two case study areas are Voi in Kenya and Tamnougalt in Morocco. These two case study locations were selected because they represent the hot-dry climate, in addition there is prevalence of brick production and use in the two areas and easy/quick accessibility to climatic and other data required for the study.

C. Research methodology

This study was an explanatory study aimed that used the case study research method to determine how and why brick architecture is sustainable. This was done through literature review and documentation of brick architecture in Kenya and Morocco located in East and North Africa respectively. Yin (2002) defines the case study research method as, “an empirical inquiry that investigates a contemporary phenomenon within its real-life context”. This method is advocated when a “why” or “how” question is being asked. This research was a non-experimental cross-sectional study as it took a cross-section of the population at one time and studied the situation as it already is without trying to input new variables. Secondary data was collected and analysed from existing literature, the relevant internet sources, books, archival/other documents and journals. Primary data was collected through observations, interviews and climatic data collection. Observation was through structured and unstructured non participant observation of the phenomena in its natural environment and was recorded using narrative, photographs and sketching. Interviews were conducted by using structured and non-structured interviews and the respondents were artisans and construction workers focusing mainly on their methods of application, materials use and any other building components. Climatic data (both indoor and outdoor) was collected by taking daily measurements of temperature and relative humidity using digital data loggers for 5 days at half hour intervals. The findings and discussions in this paper are based on variables that were identified and studied that include brick production, brick architecture and construction technology, transformation of settlements and thermal performance of traditional and contemporary brick architecture.

III. FINDINGS AND DISCUSSION

A. Case study 1- Voi, Kenya

Voi is the largest town in Taita Taveta county, located in the south east corner of Kenya. It lies at the western edge of the Taru Desert, South West of the Tsavo East National park and North East of the Tsavo West National Park. Voi town is an important nodal point in the county as it lies along the Nairobi –Mombasa highway, the new Standard Gauge Railway (SGR) line as well as the Voi – Taveta road which connects Kenya to Tanzania. Its position as the gate of the world famous Tsavo national park is also key in making it a gateway city for the region. The national parks as well as privately owned sisal estates in the region have restricted growth of the town.

Climate and terrain

Voi is 590 meters above sea level and has a hot-dry climate with about 300 mm of rainfall each year. The BSH Koppen climate classification is typical of pre-desert regions with hills that protect it from harsh and dry desert winds. Temperatures in Voi range between 20°C and 30°C with annual highs of 40°C and lows of 10°C. Relative humidity readings are low levels of 40-55% and the region typically experiences south westerly winds at 1500hrs and at 09hrs south easterly with seasonal and even daily variations. The hottest and coldest months are March and July respectively. There are distinct dry and wet seasons with short rains from March to May and long rains between October and January. In terms of terrain, to the West there is the Taru desert, to the South lies the sagala Hills and to the North east and South West the Tsavo East and West National Parks. The hot-dry climate and the high cost of irrigation explains the sparsely vegetated Voi landscape with hard dusty grounds. The seasonal Voi River which is a very important source clay, runs through the town leaving rich clay deposits in its river bed and banks that is used as a raw material for making bricks.

Brick construction technology

Brick is the main construction material found in Voi. It can be seen in low cost construction as well as high end apartments. It is also the main walling material that is used in the construction of government projects including schools, hospitals and offices. The primary source of brick used in construction in Voi is from the Sofia Brick yard which is located about 4 Km from Voi town alongside the Voi river. The brick-making techniques were passed onto the local community by brick makers from Tanzanian who were harvesting soil by the river in 2000. This site is used for mass commercial production with over 300 brick makers able to produce 1500 bricks a day. Before this commercial production of bricks was started, there were uncoordinated brick makers who could not be relied on to

supply good quality bricks to big projects. Sofia brick yard is approximately 4 km from Voi town centre. This brick yard consists of individually claimed plots of land alongside Voi River. The makers find an ideal location for minor excavation (3-5 M deep) along the river. After preparing the soil, bricks are formed manually and sun dried. Thereafter a kiln using the same bricks to be burned is built within the same location with holes through which wood is fed into the furnace for the bricks to burn for 6-36 hours depending on the size of the furnace and the quantity of the bricks. On average, it was calculated that one person can produce 500 bricks a day. Bricks in Voi have a standard dimension of 210 x 110 x 110mm (9 x 4.5 x4.5 inch) and one good quality brick costs Ksh.8.00 (1US\$=100 Kshs). A tanuri (furnace) that burns 10,000 bricks will require fuel wood of about Kshs. 9,000.0 as illustrated in Figure 3. It is estimated that a house of 10m x 12m can take approximately 1,000 bricks and developers will factor in other costs including loading and off-loading and transportation cost. It was noted that not all the bricks kilned will be suitable for construction. At least 2%-5% depending on the brick makers expertise will be defective.

<p>1. Dry soil mixture is prepared. A variety of soil is dug out and mixed together. Some from top, middle and bottom layers to get a sandy-Clayey mixture which is good for building.</p>	<p>2. Soil mixture mixed with water left to dry for 1 day to loosen up clay particles.</p>	<p>3. Mixture moulded by hand into formwork. Dimensions are 4.5 inch x 4.5 inch x 9.0 inch. Dimensions can be modified if specified.</p>	<p>4. The formed bricks are laid out to dry in the sun for 7-10 days and turned every 2 days to get consistency in drying.</p>
			
<p>5. A Tanuri (furnace) of bricks is made.</p>	<p>6. Bricks burnt for 12-24 hours depending on no. of bricks in the tanuri)</p>	<p>7. 3 days cooling time before selling the bricks.</p>	<p>8. Quick field test for buyer to check brick quality by submerging in water for 10minutes.</p>
			

Figure 1: Brick production in Sofia brick yard – Voi (Source: Field Survey 2016)

To fire the bricks a Tanuri (furnace) is constructed of the bricks with vertical and horizontal ventilation channels that moves the heat through to all the bricks as shown in Figure 1. The last layer on the outer most part of the Tanuri is made of old discarded bricks that help keep the heat in. The bricks are burnt continuously for 6-36 hours depending on the size of the Tanuri which ranges in size from 4,000 bricks to 10,000 bricks. However, it was observed that during rainy periods, bricks are covered with a plastic polythene sheet to keep away water until the rains stop. It was, noted that Voi experiences sudden and heavy rain fall which completely destroys unfired bricks and paralyzes production during this period of time which results in heavy losses to the brick makers. In the whole process of brick

production and use, there are two main causes for concern that need to be addressed. One is the degradation of Voi river bank because of the unsustainable soil harvesting methods and the burning of bricks using fuel wood which causes deforestation and releases harmful gases into the environment as shown in Figure 3. It was observed that the quality of some of the bricks produced is very poor as a result of the high demand for the bricks. This has brought in a new thinking from investors who now increasingly prefer to use conventional materials (masonry, concrete, etc.) for walling instead of the burnt bricks which are found to be inconsistent in quality.



Figure 2: Wood fuel and Soil harvesting site (Source: Field survey, 2016)

	01	02	03	04
No. of Bricks	900	1,500	4,000	10,000
Cost of Timber (Kshs)	2,500 (1 pick-up)	2,000 (1 pick-up)	4,500 (1 Lorry)	9,000 ((2 Lorries)
Hours of Burning	6	18	24	36
Dimensions- LxHxW (M)	2.4x1.3x1.6	2.5x1.8 x1.75	3.7 x 1.7 x 2.9	3.7 x 3.4 x 4



Figure 3: Sofia brick furnaces (Field survey, 2016)

Brick construction technology(Voi)

The main brick laying technology used in Voi is the stretcher bond, because is the most understood by the local artisans than the other bonds as shown figure 4. Concrete is not easily accessible and is costly so the walls are typically load bearing for low-rise structures. In modern times high property prices and rural to urban migration have necessitated multi-storey construction in order to meet the demand for living space. For high-rise brick apartments, reinforced concrete is used for structural stability and brick as an infill. Higher cost of living and construction led to the reduction in wall thickness from the traditional 300mm to 200mm and now to 150mm which

in effect has reduced the structural stability, resilience against wind, wall erosion and thermal performance of the buildings.



Figure 04: Voi Brick Construction Technology (Source: Field survey, 2016)

B. Case study 2- Tamnougalt, Morocco

Tamnougalt is a Kasbah (Berber for fortified village) located in the date palm oasis of the Draa valley in the south east of Morocco. It is located within the Zagora province which is in the Souss masaa, Draa administrative region. Ouarzate is the nearest city located 95 km away and Agdz, the nearest town is 5 km away. The name Tamnougalt in Berber means meeting point. True to its name Tamnougalt was a crucial node for nomadic Berber clans who were passing to and from the popular Saharan desert trade routes. Tamnougalt is 930 meters above sea level and has a hot and dry climate with about 300 mm of rainfall each year. The BSH Koppen climate classification is described as warm–semi arid climate typical of pre-desert regions with hills that protect it from harsh and dry desert winds. These areas are also found in close proximity to a seasonal river to alleviate the water table and keep the sparse vegetation alive. The temperatures are highest on average in July, at around 31.7 °C and lowest in January with temperatures averaging 10.4 °C and the annual temperature average is 20.5 °C. In terms of rainfall the annual average is 106 mm with June being the driest and November the wettest. Tamnougalt is found at the foot of the Atlas Mountains in Draa valley (Date palm oasis) and at the bank of the Draa river which leaves clayey soil deposits which are suitable for making long lasting brick. The mountains shield the town from harsh desert winds. The ground is hard and dusty as grass and farming activities are unsustainable due to high cost of irrigation.

Brick Production

Brick is the main construction material found in Tamnougalt. It can be found in 1000 year old fortified houses as well as in modern construction. Brick production is through specialised artisans who are hired for each project. This is an unsustainable production model as it is slow and unpredictable in terms of availability of the artisans. It is also not viable for large scale projects. The artisans make on average 500 brick a day which dry for 10 days before use. For efficiency once bricks are ready for use the workers then alternate between making bricks and constructing with the ready bricks. However in high traffic areas and socially important spaces such as the mosque and palaces; the use of burnt brick is preferred for durability. Brick is no longer the preferred construction material in the area and hence the qualified artisans who take up the trade are few which has caused a decline in the quality and hence a reduction in the demand for the material. In this set up, the sun dried brick is a much more sustainable production method than the burnt brick because it does not burn wood which in the first place is not available and of course as noted in the case of Voi release dangerous gases in the environment and cause deforestation. However, the sun dried bricks are not strong enough to withstand heavy loads thus stabilisation of the brick is done to strengthen it by addition of straw and other additives to the mixture.

The process described in Figure 5 involves preparing the mixture of soil, water and large amounts of dry straw which is an organic additive that strengthens the brick. The mixture is left for 3-4 hours for the mixture to settle before being placed in a timber formwork which the dimensions are determined by the owner depending on where the brick is to be used. For upper floors smaller dimensions (100x150x100) are advised to reduce on loading and for the lower floors larger dimensions (200x300x150) are used for structural stability. Once the bricks are moulded, they left on the floor to dry for a minimum of one (1) day and up to six (6) days in the sun then ready for use or stored.

<p>1. A mixture of soil, water and large amounts of dry straw. The straw is an organic additive that strengthens the brick. The mixture is left for 3-4 hours before being placed in timber formwork.</p>	<p>2. The formwork dimensions are determined by the owner depending on where the brick is to be used.</p>	<p>3. Formed bricks are laid out to dry in the sun for 10 days with continuous turning.</p>	<p>4. Bricks stored until they will be used for construction.</p>
 <p>Soil, water and straw mixture</p>	 <p>Brick</p>	 <p>Bricks left in the sun to dry</p>	 <p>Brick in Storage</p>

Figure 5: Brick production process in Tamnougalt (Source: Field Survey, 2016)

Construction technology

The construction technology evolved from mud and wattle single storey dwelling to multi-storey brick structures. This combination of rammed earth and sun-dried brick was used for wall construction. In multi-storey buildings rammed earth was used in the lower floors because it was structurally more stable and brick for the higher floors because it was lighter hence reducing the structural load. The walls were typically 350mm to 600mm wide hence were load bearing and were combined with timber beams and brick columns as structural support. Small windows (800x400mm) were used to have small spans and in some cases for security although this created poor internal lighting and ventilation. In contemporary brick architecture timber is replaced with concrete for beams and columns and brick or clay blocks used as wall in-fills. Traditional floor deck designs had timber supports from the date palm followed by thin timber strips from the saf saf plant. The saf saf plant was known for keeping away termites. In palaces and important rooms the timber strips were painted and arranged elaborately and decorated as shown in figure 6. Contemporary floor decks are made from concrete with plastered finish; traditional water proofing used bamboo flutes and palm leaves and while modern times waterproofing use plastic sheeting or damp proof membranes. Decorative column designs with niches for lighting and ornaments are used in the main halls of the house.



Figure 06: (Left) Ceiling with strips of saf saf wood for decoration and termite protection. (Right) Roof deck section with bamboo strips and palm leaves for water proofing (Source: Field survey, 2016).

VI. CONCLUSION

Fieldwork studies in Voi (Kenya) revealed that the soil harvesting along Voi river bank is compromising its flood plain and the burning of bricks causes air pollution and deforestation. The high number of brick artisans has increased competition and hence reduced brick quality over time which has increased the defect rate of bricks in the market. This reduces bricks' viability as a preferred sustainable material choice for construction and contributes to its low perception in the community which increases the preference of imported materials such as concrete, steel and stone. Climatic data from the traditional Brick house in Voi were more thermally comfortable than the contemporary case. This can be attributed to the use of 300mm thick walls and timber ceiling with a thatch roofing system, inward facing courtyard designs and compact urban layouts. Compared to the current construction trends that use a 150mm-200mm thick single layer wall system, corrugated iron sheets for roofing, isolated housing units with wide roads in between; all of which increases internal heat gain and reduces occupant thermal comfort.

Fieldwork studies in Tamnougalt (Morocco) reveal that Brick production has and still is predominately sun-dried with addition of straw stabilisation for strength as the scarcity and high expense of timber used in burning brick method. Trends indicate increased use of imported materials such as concrete, clay blocks and steel, hence the valuable tradition of brick construction is not being passed down through the generation which means that the quality and reliability of the bricks in the market is dropping and may lead to the total lose of this valuable construction technology unless there is increased documentation and awareness.

Traditionally Moroccan earth construction technology uses rammed earth in the lower floors for strength and Brick for the higher floors. Additionally 500mm thick walls are used and courtyards to create thermally comfortable internal spaces during the high daytime temperatures. Traditional design had small windows (800x400mm) which prevented appropriate ventilation through the spaces. Buildings typically have flat roofs and multiple verandas to use as sleeping areas on hot nights. Contemporary brick design uses larger openings (1500x1000mm) which increased ventilation and natural lighting in the spaces but the urban layout has moved from compact layouts with winding streets to isolated units. In contemporary design concrete is used for the structural member instead of timber as it is scarce and is vulnerable to termite attacks.

Fieldwork findings conclude that there are various advantages and disadvantages to brick construction technology. These include unregulated soil harvesting, use of imported labour and techniques, use of imported materials, high energy brick production techniques, loss of knowledge transfer and thermally uncomfortable architectural design strategies. This is despite the great lessons traditional brick construction techniques found in each region. In Voi trends in brick construction show depleted river banks quarries, use of imported materials, un-finished and thermally uncomfortable brick buildings. In Morocco trends in brick construction show the loss of knowledge transfer of construction techniques usually passed down from generation to generation, contemporary lower quality brick architecture and a move away from compact to sprawling urban layouts.

This study recommends appropriate soil harvesting, use of local labour, simple construction technology, use of locally available resources, incorporation of government and community regulation of soil harvesting sites to ensure rehabilitation of the quarries, use of local labour and low energy construction and production techniques, documentation and training of appropriate traditional and contemporary techniques.

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AUTHORS

First Author – Dr. Laban Ungai Shihembetsa, PhD in Architecture, University of Nairobi, shihe@uonbi.ac.ke

Second Author – Etta Madette, Bachelor of Architecture (Hons), University of Nairobi, ettamadete@gmail.com

Analysis of Human Heat Stress in Sri Lanka: Using Temperature Humidity Index (THI)

N.W. Srimalee Nanayakkara¹ and K.W.G. Rekha Nianthi²

^{1,2} Department of Geography, University of Peradeniya, Sri Lanka

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Abstract - The Human Comfort Index (HCI) is known as the apparent temperature of the human body which is used to calculate Human Heat Stress (HHS). This is how the human body feels effects of the combination of Relative Humidity (RH) and Air Temperature (AT). This index is very important for human health, recreation activities, human productivity, tourism, urban planning and etc. Climate change is likely to bring mainly temperature increases in Sri Lanka – It might increase the HHS in the island. Analysis of HHS in Sri Lanka is limited and even today bioclimatic map has not been introduced for the country. The primary objective of this study was to calculate the HHS by Temperature Humidity Index (THI) which is one of the calculation methods of HCI. RH and AT data have been collected from Meteorology Department. The linear regression analysis, Arc GIS 10.4: Interpolation analyses of Radial basis function and Universal Kriging method, Mann-Kendall statistical test have been engaged in data analysis. HHS is calculated from 2006 to 2016 for 35 temperature stations. According to the annual THI, 04 stations are found as Comfort with Cold (THI=14.2-22.3), 04 stations are found as Extremely Comfort (THI=22.4–25.1), 05 stations are found as Comfort (THI=25.2–26.3), 12 stations are found as Slightly Comfort (THI=26.4–26.8) and 10 stations are found as Moderately Comfort (THI=26.9–27.5). Comfort with Cold and Extremely Comfort THI are located in the Central Highland where this range is sustained throughout the year. Out of 12 stations, 09 are located in the Intermediate Zone with Slightly Comfort range. Out of 10 stations, 08 stations are found in the Coastal Zone with Moderately Comfort range. HHS is also compared with two standard periods (1931-1961) and (2006-2016) for 15 main stations. Results revealed that the highest increase of THI is noticed in Anuradhapura (+ by 1.0) and the lowest THI is noticed in Badulla (+ by 0.2). The highest positive significant increasing trend of THI was noticed in Rathnapura (R^2 0.80) and Kundasale (R^2 0.83). Based on the THI, the spatial and temporal Bioclimatic maps have been created to show comfortable and less comfortable zones in Sri Lanka.

Index Terms- Temperature Humidity Index, Human Comfort Index, Human Heat Stress

I. INTRODUCTION

The theme of geography consists of inter-relation activities among, man, society, and environment (Mackinder, 1951). Climatology is the very specific field of Geography. Ellan

(1932) stated that climate is one of the physical sources extremely affect not only for thinking but also the behaviors and activities of the human being and their cultural landscape. Howard (1995) explained that human health, energy, and comfort are determined by climate in the physical environment. Physiological functions of the human body respond to changes of the weather and some certain diseases are occurred due to the climate and climatic seasons. The condition of the atmosphere is also influenced to our mental and emotional outlook.

With global climatic change, Sri Lanka climate has also been changing. The temperature has an increasing trend and rainfall and humidity level have a decreasing trend. Annual mean, maximum and minimum air temperature anomalies have shown significant increasing trends during the past few decades in Sri Lanka (Rekha, 2003). This condition may highly influences to increase the Heat Stress in Sri Lanka. This research tried to analyses the spatially varied heat stress in Sri Lanka. The Human Comfort Index (HCI) is known as the apparent temperature of the human body which is used to calculate Human Heat Stress (HHS). This is how the human body feels the effects of the combination of Relative Humidity (RH) and Air Temperature (AT). In this contest, the pattern of behavior of temperature and humidity of atmosphere are very important sources for all the beings. These climatic elements are considered as determinants of comfortable and uncomfortable of the environment. This index is very important for human health, recreation activities, human productivity, tourism, urban planning and etc. The trend of temperature has been increasing in Sri Lanka and it might impact to the well-being of the nation. People could be suffering from the heat stroke, heat rash (skin), and dehydration in future (Sathyamoorthy, 2016). Ajith (2016) stated that heatstroke is a possible hazard to the current weather conditions in Sri Lanka. Emmanuel (2004) mainly focused Thermal Heat Index (THI) in Colombo city and found that THI has continuously increased in the daytime as well as in the night time.

An attempt of measuring the heat stress using annual average temperature and relative humidity are very rare in Sri Lanka. All the attempts made in Sri Lanka for measuring heat stress were limited to a certain framework, and so far no individual or institutional level efforts to do any research on the overall heat stress by using the human comfort index in Sri Lanka. A bioclimatic map was not created to identify the comfortable and uncomfortable zones so far in Sri Lanka. It seems to be a big shortcoming in the metrological analysis in the country. This

study focuses to observe the geographical formation, measure the prevailing climatic tendencies, human heat stress of Sri Lanka. The study analyses the spatially and temporal variations of THI by using Human Comfort Index to create a bioclimatic map. It would be very useful for future studies, planning purposes and making policies for various sectors of development activities in Sri Lanka.

II. MATERIALS AND METHODS

The primary objective of this study was to calculate the HHS by THI which is one of the calculation methods of HCI. These indexes express thermal stress by indicating the temperature which combines with the relative humidity of the atmosphere; it measures three thermal reactions, such as *too warm*, *comfortable* and *too cool* of atmosphere. As Sri Lanka is a tropical country, this Temperature – Humidity Index is more suitable for calculating the HHS. This index was invented by Niewwolt in 1975; $(THI=0.8T+(T \times RH)/500)$. Normally THI values were classified under the following intervals (McGregor & Niewwolt, 1998);

- i. $21 \leq THI \leq 24 = 100\%$ of the subjects felt comfortable.
- ii. $24 \leq THI \leq 26 = 50\%$ of the subjects felt comfortable.
- iii. $THI > 26 = 100\%$ of the subjects felt uncomfortable and hot.

These results are based on experiments in the mid-latitude countries. People who live constantly in tropical lowlands probably can tolerate higher values of the THI or ET somewhat better, as nutrition, clothing and general speed of physical activities are all adjusted to a hot climate (Howard, 1995).

For this study spatial data was collected by using secondary sources and acquired from; Colombo Meteorology Department, Statistical abstracts of the Statistical Department, Long-term Hydro-Meteorological data book (Nakagawa et al, 1995) and various research articles. The data used from 1931 to 1960 to analyse the previous situation in human heat stress and data from 2006 to 2016 is used to calculate the existing situation and forecast the future trends of heat stress in Sri Lanka. 35 stations are selected for collecting data. 16 stations out of 35 stations are agro-meteorological stations and 19 of them are belongs to the main meteorological stations in Sri Lanka. The main objective of this study was to analyses the human heat stress in Sri Lanka by using HCI. The methodology had the following steps for analysing the indices.

- i. The bioclimatic map is created by using the isotherm method to identify comfortable zones of Sri Lanka. Tools of radial basis function and universal cringing kriging methods under interpolation analysis in Arc map 10.4.
- ii. The seasonal temperature and relative humidity variations are observed in Sri Lanka. Spatial and temporal heat stress is also analysed with respect to the four main seasons in the country.
- iii. For each month, human comfort index was calculated in order to identify the spatial changes occurred in heat

- stress during the 12 months in the selected years to identify the spatial patterns with time periods.
- iv. 19 Meteorological stations and 16 Agro-Meteorological stations are selected for this study (Figure 1).

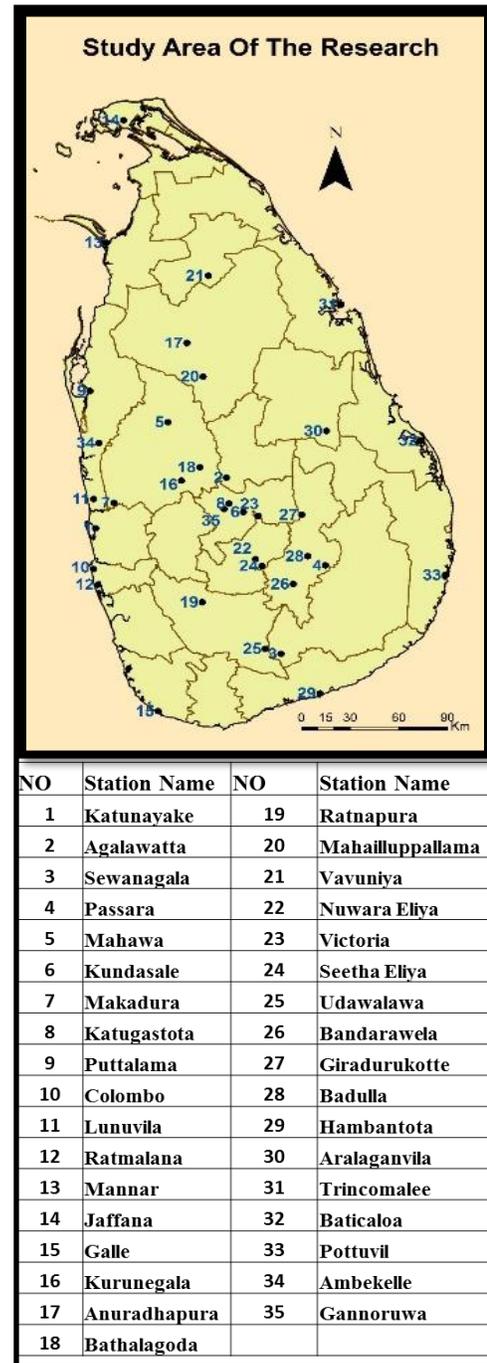


Figure 1: Locations of the 35 Meteorological and Agro-Meteorological stations

Human heat stress has been observed relatively under two periods. Data related to temperature and humidity is used from 1931 to 1960 and from 2006 to 2016 to calculate the central tendency and Disperse measurement. These comparative two sets of periods provide the past and current situation of human heat

stress. This observation tries to identify the new trends of the heat stress in Sri Lanka. This analysis also tries to forecast the future trends of heat stress in Sri Lanka. The linear regression analysis has been applied to visualize the trends. The Mann-Kendall statistical test was engaged to examine the significant of THI trends. Existing trends in human heat stress has identified the negative and positive future trends. Various types of statistical methods were used with the computer soft wares to analyse the data. In addition to that, cartographical methods, display maps, and charts have been used in this context.

III RESULTS AND DISCUSSION

THI classification of Niewwolt (1975) does not show a much spatial variation of the heat stress in Sri Lanka. Therefore taking this classification as the basic taxonomy, new classification was separated into 06 class intervals to identify spatial variation of THI more clearly. This research introduced new THI classification system for Sri Lanka (Figure 2).

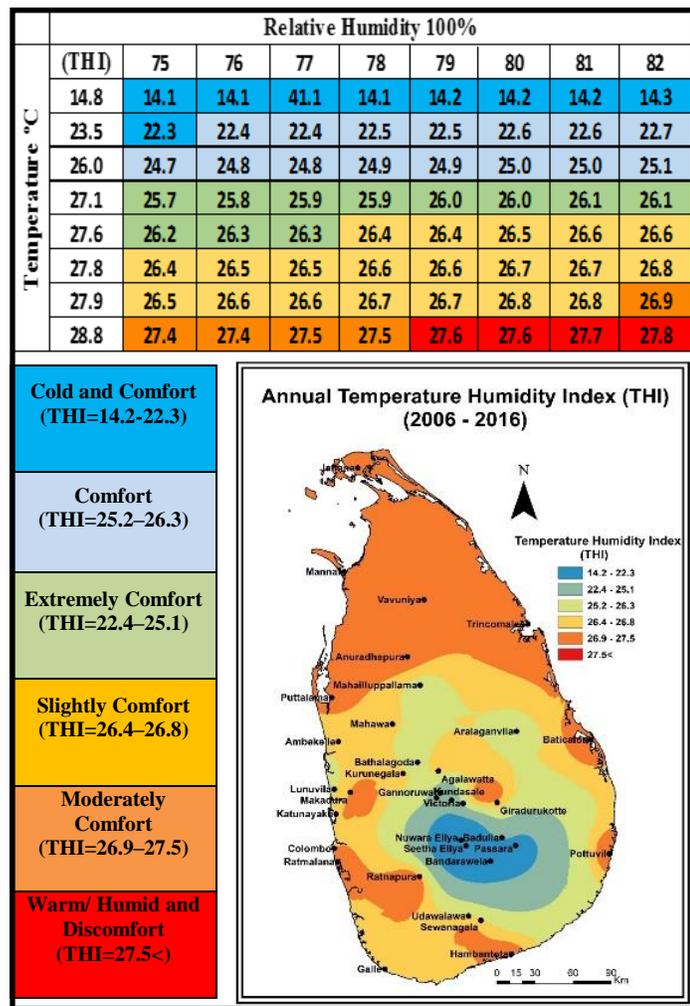


Figure 2: Classification of Temperature Humidity Index and introduce the Bio Climatic Map for Sri Lanka

When consider about the annual pattern of THI in the island, Comfort with Cold Level can be recognized only the stations situated in Central Highland mainly at Nuwara-Eliya, Seethaeliya, Bandarawela, and Passara stations. Many stations with Extremely Comfort Level are gather round the Central Highland at Katugastota, Badulla, Kundasale and Gannoruwa stations. Out of 12 stations, 09 are located in the Intermediate Zone (elevation 30-300 m) with Slightly Comfort Level range and out of 10 stations, 08 stations are found in the Coastal Zone with Moderately Comfort Level. THI values are changing with the seasonal rainfall, environment lapse rate and effect of Kachchan wind which are occurring with the nature of the topography and orography. There is a strong relationship found in between THI and elevation. The Comfortable level has been changing along the slope of the Central Highland. The study revealed that when elevation increases the THI decreases in Sri Lanka. An important fact is that one of the cooling mechanisms called laps rates and it functions in every 1000m from sea level to highland the temperature is falling down by 6.5°C, as a result, the temperature is decreasing. On the other hand low temperature is reported in Central Mountains than sea level and intermediate zones. With the low temperature, the higher value of humidity is noticed in this area with the elevation is increasing; the decrease of the THI value is also recorded.

The distribution pattern of wet zone and dry zone also affect by the THI value. Normally higher THI values are recorded from the coastal zones and intermediate zones. But the highest THI value is recorded from the stations which are located in the dry zone than from wet zone. Central Highland in Sri Lanka is performing a significant role in changing climatic elements. This also strongly affects the change of spatial THI values in the country. In considering the above facts the south-western part is more comfortable than north-eastern part of Sri Lanka. One of the reasons for this pattern is the higher humidity level on the south-western side than on the north-eastern side and the temperature is lower on the western side than the north-eastern side. As a result of this distinction the comfort level in the wet zone is greater than in the dry zone. The wind lifting mechanisms, called orographic lifting and blowing of Kachchan wind also greatly affected this situation. As a result, the windward side is experienced heavy rain and the leeward side experience as the rainy shadows. Further, this performance controls humidity and temperature in both sides of central mountains. Owing to this process uncomfortable environment is created in the leeward side, and body convenience in the environment is created in the windward side. As a consequence, seasonal rainfall pattern are highly affected for the variation of THI over the land (Figure 3).

Higher THI value was recorded in the First Inter-Monsoon (FIM) and the South West Monsoon (SWM) seasons. A quite uncomfortable situation was observed from many stations in North part of the country. For an example during the FIM season, warm/humid and discomfort level was observed from 6 stations and during the SWM from 7 stations except for south-western part. During the both FIM and SWM seasons, out of 35 stations, only 3 stations recorded extremely comfort level. Even though slightly comfort was visible entire Sri Lanka during the Second

Inter-Monsoon (SIM) season, it is not much comfortable like in North East Monsoon (NEM). During this season, no any other stations recorded the state of warm/humid and discomfort level. This study revealed that, NEM season as the common comfortable season for entire Sri Lanka and in this period no any other station observed discomfort level. 11 stations are recorded as extremely comfort level in this season. Many of the stations which recorded comfort level are also visible in this season. They are 17 in number.

According to the seasons, table 1 shows the minimum and maximum THI values with the locations.

Table 1: Seasonal THI (Maximum and Minimum) with stations

THI variation can be observed for each month (Table 2). February is the most comfortable month and May is the uncomfortable and hottest month on the island. When compared with two standard periods (1931-1961 and 2006-2016) for 15 main stations, it is identified an increasing trend of HHS in Sri Lanka.

Table 2: THI comfort levels, with monthly classification

Months	Comfort with Cold	Extremely Comfort	Comfort	Slightly Comfort	Moderately Comfort	Warm/Humid and Discomfort
Dec	5	9	19	2	0	0
Jan	6	17	12	1	0	0
Feb	5	8	17	4	1	0
Mar	5	3	3	12	11	1
Apr	4	2	2	2	13	12
May	4	3	1	2	10	15
Jun	4	4	1	5	10	11
Jul	4	4	4	6	9	8
Aug	4	4	3	8	8	8
Sep	4	4	3	11	6	7
Oct	4	4	6	11	10	0
Nov	5	4	16	10	0	0

 Comfortable
 Uncomfortable

According to figure 4, a considerable variation of THI is recorded from Anuradhapura station and it increased by 1.0°C from 1931-1961 to 2006-2016. Badulla station is recorded minimum variation between above two periods and its differences is 0.1°C. The large variation of THI, are shown at Hambantota, Batticaloa, Colombo, Galle, and Trincomalee. It was found that, even though the Kandy and Nuwara-Eliya are situated in the central highland the THI has increased with similar to the other stations which are located in the dry and coastal zone. The Nuwara-Eliya THI is increased by 0.8°C. According to that graphical information, THI values are increased with respect to the changing of other climatic parameters too i.e. Temperature and Relative Humidity.

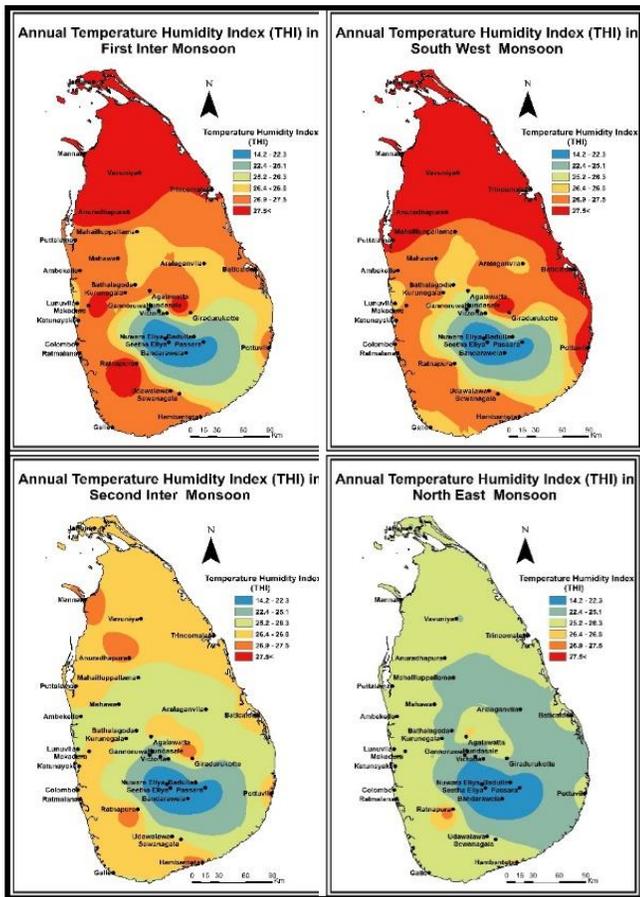


Figure 3: Seasonal variation of THI in Sri Lanka

Season	Maximum		Minimum	
	THI	Station	THI	Station
FIM	28.0	Anuradhapura	16.0	Nuwara-Eliya
SWM	28.8	Trincomalee	16.1	Nuwara-Eliya
SIM	26.8	Trincomalee	15.8	Nuwara-Eliya
NEM	26.4	Ratnapura, Hambantota	14.7	Seetha-Eliya

Figure 5: Increasing trend of THI in Rathnapura and Kundasale

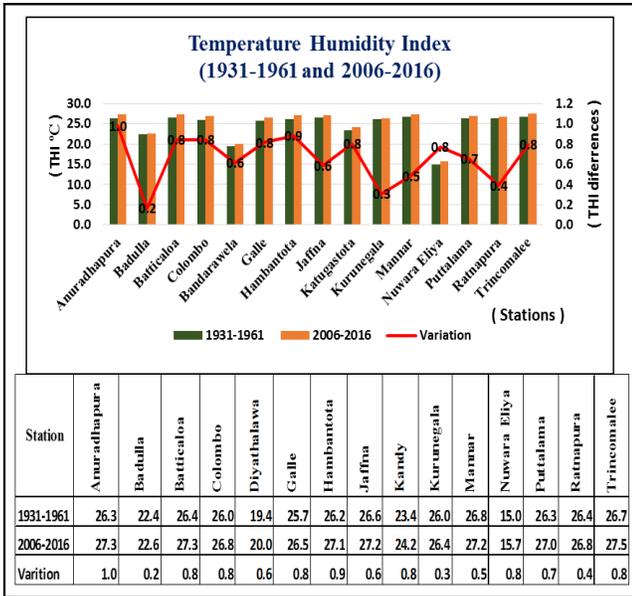


Figure 4: THI differences from 1931-1961 to 2006-2016

One or two degrees of temperature have increased for a long time period but this small change makes big issues on the heat stress of THI which may create large changes in the human body and sensitive environment.

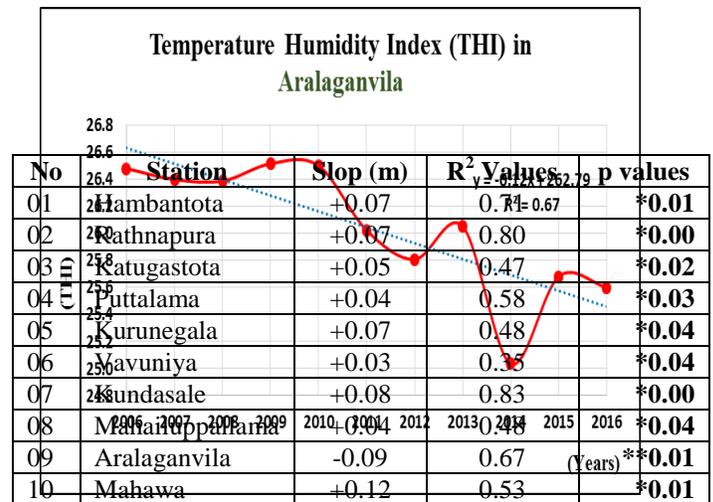
The annual trend of THI, the positive increasing trend of the heat stress, as well as the decreasing trend of the THI, can be observed from 2006 to 2016 in selected 35 stations. Out of 35 stations 30 stations had recorded increasing trend of THI and 5 of them showed a decreasing trend of THI. Hambantota, Ratnapura, Puttalam, Kundasale and Mahawa stations show clear increasing trends (R^2 0.50) and the stations of Ratnapura and Kundasale recorded greater than R^2 0.80. These both stations have strong positive increasing trend of THI than other stations. Among the 35 stations, Badulla, Katunayake, Aralaganvila, Gannoruwa and Victoria stations are showing a decreasing trend and Aralaganvila is showing a clear negative decreasing trend (R^2 0.67).

Figure 6: Decreasing trend of THI in Aralaganvila

To observe the significant level of THI the Mann-Kendall statistical analysis has been applied. The calculated p-value shows the significant level of THI in each station and found that the $p < 0.05$. Table 3 visualizes the significant trend of THI in 10 specific stations annually.

Table 3: R^2 and p-value in each station

Note: Bold numbers are significant, *significant positive, **Significant negative



According to this graph, it is clear that 10 stations are showing the significant trend of the THI value in Sri Lanka. But among these 10 stations, 9 stations are showing increasing significant trend of the THI and only Aralaganvila station showing decreasing trend of the THI. Monthly trends also very important for identifying the significant negative and positive trends of the heat stress in the country (Table 4).

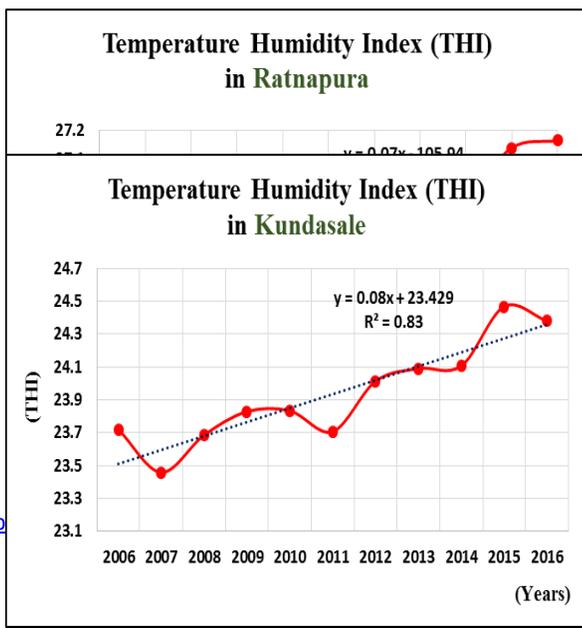


Table 4: Monthly significant trend of THI

Mo	Number of Stations			
	IT	Stations	DT	Stations
Jan	9	Hambantota, Ratnapura, Kurunegala, Mahailukpallama, Kundasale, Makadura, Passara, Mahawa, Sewanagala	0	No
Feb	2	Hambantota, Lunuvila	1	Victoria
Mar	3	Katugastota, Puttalama, Mahawa	1	Aralaganvila
Apr	3	Ratnapura, Mahawa, Ambekelle	0	No
May	3	Pottuvil, Kundasale, Ambekelle	1	Aralaganvila
Jun	2	Ratnapura, Kurunegala,	1	Aralaganvila
Jul	8	Ratnapura, Katugastota, Puttalama, Kurunegala, Kundasale, Lunuvila, Mahawa, Ambekelle	1	Aralaganvila
Aug	4	Jaffna, Ratnapura, Mahawa, Sewanagala	1	Aralaganvila
Sep	0	No	1	Aralaganvila
Oct	3	Hambantota, Puttalama, Mahawa	1	Aralaganvila
Nov	1	Udawalawa	2	Aralaganvila, Victoria
Dec	3	Sewanagala, Kundasale, Hambantota	0	No

Note: IT: Increasing Trend, DT: Decreasing Trend

Aralaganvila is one and only station which recorded 8 out of 12 month as significant decreasing trend of heat stress. November and September months of this stations are more significant than other months. In this station, 6 months are visualized as the significant trend and January month is more significant than the other months because $p \leq 0.05$. In North East Monsoon season only the increasing trend of THI are observed. Hambantota, Kundasale, Ambekelle and Sewanagala stations showed the significant increasing trend of THI values because the $p \leq 0.05$. Hambantota station is special than other stations and it recorded strong significant increasing trend of THI than other stations. SWM period also recorded increasing trend, but in this time Badulla and Aralaganvila stations show significant decreasing trend of THI. FIM and SIM period couldn't identify significant increasing trend of IHT, but in the same season, Badulla and Aralaganvila stations show significant decreasing trend of the Human Heat Stress.

IV. CONCLUSION

The spatially and temporally the Temperature Humidity index (THI) is varied in Sri Lanka. It was clearly observed on monthly, seasonally and annually. The annual pattern of THI, of the most of the stations are noticed as a slightly comfort level. High THI values generate the stressful and uncomfortable conditions and most of the coastal and dry zones areas are found in this category. 100% of the comfort zones are gathered around the

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Central Highland and with the increases of elevation human body feel cold and comfort. There is a strong relationship among the elevation with environment lapse rate and Temperature Humidity Index in Sri Lanka and when elevation increases the THI decreases and vice versa. THI directly depends on monsoon wind and rainfall pattern in the island and it is controlled by Central Highland with the deferent elevation levels. With the effect of Kachchana wind, the wind-word side receive more rainfall and it becomes a comfortable than the leeward side. During the SWM period south-western part performance as the wind word side and this western slop get more comfortable condition than the northern side. SWM period recorded maximum THI in North part, but during the NEM period entire Sri Lanka tern to a comfortable situation. When considering the monthly pattern of THI, February is the most comfortable month and May is the uncomfortable and hottest month on the island. There is a positive increasing trend of the THI in the country (from 1931-1961 to 2006-2016). It is not a big issue today, but continues increasing trend of heat stress will make several complications of health of the nation in the country.

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AUTHORS

First Author – Nanayakkara NWS, (BA Special Degree in Geography), Temporary Lecturer, Department of Geography, University of Peradeniya, Sri Lanka, srimalleenw@gmail.com

Second Author – Dr. K.W.G. Rekha Nianthi (PhD), Senior Lecturer, Department of Geography, University of Peradeniya, Sri Lanka, rekhanianthi@yahoo.com

Correspondence Author – Nanayakkara NWS, (BA Special Degree in Geography), Temporary Lecturer, Department of

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Geography, University of Peradeniya, Sri Lanka,
srimaleenw@gmail.com, TP: 071-7524899.

Communication for nature conservation. A case study of Dongtan Wetland Park, Shanghai, China.

Lukasz Madrzynski*

*Tongji University College of Environmental Science and Engineering, Shanghai, 200092, P.R. China

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Abstract: This article aims to review communication approaches and their practical application in nature conservation projects. It is based on a case study of Dongtan Wetland Park located in Shanghai, China and utilizes communication strategy planning approach in identifying main stakeholders and analyzing communication activities performed by the management of the park. It examines the core communication approaches of marketing, branding, public relations, fund raising, conflict management, environmental education, capacity building and stakeholder management. The article highlights the importance of communication strategy planning in nature conservation projects and provides recommendations for improved communication management of Dongtan Wetland Park.

Index Terms: Communication strategy planning, Stakeholder management, Nature conservation, Park visitors.

1. Introduction

Communication plays a crucial role in planning and management of nature conservation projects (IUCN, 2003; Gardner, 2009; F. Hesselink, 2007; L. A. Lindenfeld, 2012). The purpose of this paper is to review communication activities and their practical application in a nature conservation project. It is based on a case study of Dongtan Wetland Park located on Shanghai's Chongming Island. The park is an experimental nature conservation project located in a buffer zone of a strict wetland conservation area. The location makes its operations more dependent on external funding than nationally funded strict nature protection area to which it is adjacent. It relies on visitors to finance its operations and to effectively conserve the rehabilitated natural environment within its area. It was once degraded by intensive agriculture and has been brought back to life to serve as a bird sanctuary. Nowadays it is a home for many endangered species of birds and aquatic creatures. In recognition of the rehabilitation undertaken on the park's grounds, it has been listed as a RAMSAR site. Projects such as Dongtan Wetland Park must find efficient management and operations techniques to balance the goals of nature conservation with tourism activities that provide indispensable funding for its operations. This research is attempting to identify the efficient communication tools and techniques that will allow projects of this type to effectively conserve environment, provide environmental education and assure undisturbed funding.

2. Research Elaborations

Communication tools and theories, if used properly, allow efficient and effective distribution of resources and manpower used in planning and operating a nature conservation project (D. Elcome, 1999; IUCN-CEC, 2011; NAPANT, 2007; CI, 2006; Saeed, 1998). In this study we first gather information on the communication related activities that are being undertaken by the managing staff of Dongtan Wetland Park. We examine the main channels of communication and the importance of different stakeholders in achieving nature conservation goals. This is accomplished by the means of key person interview. Secondly, we collect and analyze data on one of the crucial stakeholder groups for Dongtan Wetland Park, namely the park visitors. This goal is achieved by conducting a park visitor questionnaire survey.

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Interviewed person has been selected from within the Marketing Department of Wetland Dongtan Park, due to high engagement level of this department in communication related activities. Mr. Zhu who is the Vice President of Marketing Department in Dongtan Wetland Park agreed to take part in the interview and to answer questions about park's communication activities as well as its main stakeholder groups and channels of communication. Mr. Zhu has been involved in the planning process and development of Dongtan Wetland Park prior to its public opening. His active engagement in the park's planning, development and operation make him valuable and credible source of information on park's communication management and operations.

The official interview was conducted on the 25th of May 2013 in the Marketing Department office of Dongtan Wetland Park at 4pm. The purpose of the interview was first explained to Mr. Zhu through electronic correspondence in early April 2013. That correspondence included also the list of questions and topics that would have been mentioned during the interview. Interview preparation was discussed again during a personal meeting, two weeks before the actual interview. Sending the interview questions beforehand allowed Mr. Zhu better preparation and guaranteed clear and undisturbed proceeding of the interview. The questions have been arranged in an easy-to-read form and incorporated check boxes for the interviewee's convenience. This form was prepared in both English and Chinese language versions. Interview lasted for 45 minutes and has been audio recorded in its entirety. It was conducted entirely in Chinese language and translated into English by one of the authors of this research.

Another stage of the research was to collect and analyze information on one of the crucial stakeholder groups for Dongtan Wetland Park, namely the park visitors. A survey has been conducted to collect quantitative data on the visitor profile and opinions. The methodology and questionnaire for the survey have been developed with the help of publication titled *Designing and Testing a Park-based Visitor Survey* (Susan A. Moore, 2009). Other sources included Peak District National Park Authority Visitor Survey 2005 (Davies, 2005) and a summary report prepared for Minnesota State Park Visitor Survey (Anderson Dorothy, 2002). The questionnaire was composed of the questions relating to age, gender, education, occupation, income, residence, purpose of travel, type of travel, overnight stay, accommodation type, source of information about DWP, number of previous visits, overall and specific satisfaction levels, suggested improvements, important aspects of wetland conservation and if park will be recommended to friends. All questions were equipped with multiple answer options.

Visitor survey was conducted during Labor Day holiday on 29th April and 2nd May 2013. It was estimated that the daily number of visitors for that holiday period should fluctuate between 1000 to 2000 visitors. Building on that visitor number estimate, it was agreed that the surveyed should be set for 5-10% of total daily visitor count and the survey should be conducted twice on two separate days of the holiday period. Consequently, the target number of completed questionnaire was set for 200 questionnaires in total, one hundred per one survey day. The survey was undertaken both inside the visitor reception center (stationary surveying desk) and outside on the grounds of the wetland park (at resting spots).

3. Findings

3.1. Stakeholder Communication Management

Mr. Zhu has identified the Dongtan Wetland Park staff, local industry, general public and visitors as crucial stakeholder groups for the operations of the park (Table 1).

Table 1: Stakeholder importance.

What is the importance of each group in achieving park's nature conservation goals?					
	<i>Not important</i>	<i>Not very important</i>	<i>Important</i>	<i>Very important</i>	<i>Crucial</i>
<i>Colleagues ,supervisors, subordinates</i>					X
<i>Local residents</i>				X	
<i>Local farmers</i>				X	
<i>Local business owners</i>		X			
<i>Local industry</i>					X
<i>General public</i>					X
<i>Local NGO's</i>			X		
<i>International NGO's</i>		X			
<i>Local government</i>				X	
<i>Provincial government</i>				X	
<i>National government and Ministries</i>			X		
<i>Private donors and foundations</i>			X		
<i>Tourists/ Visitors</i>					X
<i>Tourism industry (agencies, hotels...)</i>				X	

Communication channels (Table 2) that are used by the Dongtan Wetland Park in the greatest extend include: posters, brochures/leaflets and phone calls. Channels that are being used often include:

- TV broadcasts - approximately one broadcast in Shanghai TV Channel every season.
- Radio broadcast – Park’s representatives are often on radio. Mr. Zhu himself appeared on local radio three times.
- Newspaper articles
- Meetings – Meetings are being held for marketing purposes as well as organizational meetings with supervisors and leaders.
- Site visits/Park visits
- Information centers - Tourist inquiry desk provides information to many visitors.
- Displays and Exhibitions - Displays and exhibitions inside the park are organized often. Exhibitions outside the park are organized rarely.
- Reports/Annual reports - Annual plans and reports are prepared for internal circulation.
- Websites - There were around 800.000 visits on park’s website within last three years.
- CD-ROMs – Promotional Video CD’s are given to companies and enterprises.

- Emails
- Social-networking websites – Dongtan Wetland Park is active on Weibo and Weixin.

The only communication channel that is never being used is newsletter.

Table 2: Communication channels.

How frequently do you use each communication media/channel?					
	<i>Never</i>	<i>Rarely</i>	<i>Sometimes</i>	<i>Often</i>	<i>Very often</i>
<i>TV broadcasts</i>				X	
<i>Radio broadcasts</i>				X	
<i>Newspaper articles</i>				X	
<i>Journals/Magazines</i>			X		
<i>Press releases</i>			X		
<i>Meetings</i>				X	
<i>Workshops</i>			X		
<i>Site visits/Park visits</i>				X	
<i>Information centers</i>				X	
<i>Displays/Exhibitions</i>				X	
<i>Films/Videos</i>			X		
<i>Posters</i>					X
<i>Brochures/Leaflets</i>					X
<i>Reports/Annual reports</i>				X	
<i>Websites</i>				X	
<i>CD-Roms</i>				X	
<i>Emails</i>				X	
<i>Phone calls</i>					X
<i>Newsletters</i>	X				
<i>Social-networking websites</i>				X	

Internal communication in Dongtan Wetland Park between colleagues, supervisors and subordinates is conducted mainly through meetings, reports, emails and phone calls (Table 3). Local residents, farmers, business owners, general public and visitors are being communicated with through the following channels: TV and radio broadcasts, newspaper and magazine articles, posters, websites and social networks. To contact Local Non-Governmental Organizations the park is using meetings, park visits, exhibitions, CD-ROMs and emails. International NGO’s are contacted through emails. Local, provincial and national government leaders are being communicated with through meetings, park visits, exhibitions and films/videos.

Table 3: Stakeholders and communication channels.

Stakeholders:	Answers:		Channel:
<i>Colleagues, supervisors, subordinates</i>	6,14,17,18	1	<i>TV broadcasts</i>
<i>Local residents</i>	1,2,3,4,12,15,20	2	<i>Radio broadcasts</i>
<i>Local farmers</i>	1,2,3,4,12,15,20	3	<i>Newspaper articles</i>
<i>Local business owners</i>	1,2,3,4,12,15,20	4	<i>Journal/Magazine articles</i>
<i>Local industry</i>	-----	5	<i>Press releases</i>
<i>General public</i>	1,2,3,4,12,15,20	6	<i>Meetings</i>
<i>Local NGO's</i>	6,8,10,16,17	7	<i>Workshops</i>
<i>International NGO's</i>	17	8	<i>Site visits/Park visits</i>
<i>Local government</i>	6,8,10,11	9	<i>Information centers</i>
<i>Provincial government</i>	6,8,10,11	10	<i>Displays/Exhibitions</i>
<i>National government and Ministries</i>	6,8,10,11	11	<i>Films/Videos</i>
<i>Private donors and foundations</i>	6,8,10,11	12	<i>Posters</i>
<i>Tourists/ Visitors</i>	1,2,3,4,12,15,20	13	<i>Brochures/Leaflets</i>
<i>Tourism industry (agencies, hotels...)</i>	13,15,17,18	14	<i>Reports/Annual reports</i>
...		15	<i>Websites</i>
...		16	<i>CD-Roms</i>
...		17	<i>Emails</i>
...		18	<i>Phone calls</i>
...		19	<i>Newsletters</i>
...		20	<i>Social-networking websites</i>

According to Mr. Zhu, the four main stakeholder groups with crucial importance to Dongtan Wetland Park are parks personnel, general public, visitors and local industry. It could be argued however that even though the industry has a big potential of damaging park's environment it has recently been curbed in that area due to strict environmental regulations of Chongming County as part of the Chongming Eco-island project (Z.O. Huang, 2008). Local, provincial and national governments have a great greater impact on the parks operation through planning, implementation and enforcement of new regulations. In that sense, governmental institutions of all levels have greater impact on the operations and objectives of Dongtan Wetland Park than local industry itself. General public and visitors considered by Mr. Zhu as essentially the same stakeholder group. However, those two groups should be treated differently. Visitor group is a subgroup of general public that have decided to visit Dongtan Wetland Park. It should be pointed that park visitors do not represent the majority of general public, but only the group that decided to visit the park. The communication channels used for those two groups should also be clearly separated. General public is communicated through marketing, branding and public relations. Visitors are communicated through personal interactions with park's personnel, environmental education and interpretation as well as the available facilities and activities.

3.2. Park Visitor Survey

According to the results of park visitor survey (Table 4), respondents that come to Dongtan Wetland Park are men (54.8%) and women (45.2%) from Shanghai (83.9%) between 18 and 45 years old (72.8%). Majority of visitors has Junior College, Bachelor or Master diploma (72%) and are employees of Chinese or joint venture companies (53.3%) with annual income between 100.000 to

180.000 RMB (52%). Great majority of visitors came to park for the first time (86.4%) as a result of friend introduction (39.2%) or information provided on the internet (34.5%). 62.5% of them drove their own cars to the park seeking relaxation (42.6%) and closure with nature (22.8%). They were satisfied with being close to nature (54.37%) and with the beauty of park's environment (30.42%). They suggested that improvements should be made to park's infrastructure (24.91%), restaurants (23.08%), activity choice (21.98%) and transportation (20.15%). They also suggested that park should provide more fishing (42.40%) and water game (33.3%) activities. Nearly 60% of visitors spent the night on Chongming Island in a local guesthouse (58.8%) or economy hotel (29.40%) They believe that the main reasons for protecting wetlands are its function as a bird sanctuary (34.05%) and biodiversity reserve (30.47%). 15.4% of visitors were very satisfied with the park and 46.2% were quite satisfied. 34.4% of visitors thought the park visit experience was average. Great majority of visitors (78%) will recommend Dongtan Wetland Park to their friends.

Table 4: Visitor survey results.

1) Gender:	Male	109	54.80%
	Female	90	45.20%
	TOTAL	199	100.00%
2) Age group:	Under 17	14	7.20%
	18-25	36	18.50%
	26-35	66	33.80%
	36-45	40	20.50%
	46-55	21	10.80%
	56-69	16	8.20%
	Over 70	2	1.00%
	TOTAL	195	100.00%
3) Education level:	Under High School	26	13.00%
	High School	26	13.00%
	Junior College	42	21.00%
	Bachelor	74	37.00%
	Master	28	14.00%
	Doctoral and over	4	2.00%
	TOTAL	200	100.00%
4) Occupation:	Company employee	57	29.20%
	Join-venture company	47	24.10%
	Freelance	33	16.90%
	Student	30	15.40%
	Other	12	6.20%
	Retired	11	5.60%
	Government position	4	2.10%
	Farmer	1	0.50%
	TOTAL	195	100.00%
5) Annual income:	Under 30.000 RMB	34	19.40%
	30.000-50.000 RMB	31	17.70%
	50.000-100.000 RMB	56	32.00%
	100.000-180.000 RMB	35	20.00%
	180.000-300.000 RMB	7	4.00%

	Over 300.000 RMB	12	6.90%
	TOTAL	175	100.00%
6) Residence:	Shanghai	161	83.90%
	External provinces	16	8.30%
	Zhejiang, Jiangsu, Jiangxi	8	4.20%
	Abroad	7	3.60%

7) Number of visits in DWP:	First time	172	86.40%
	Second time	21	10.60%
	Third time	1	0.50%
	Over three times	5	2.50%
	TOTAL	199	100.00%
8) Type of travel:	Self-driving trip	125	62.50%
	Public transportation	71	35.50%
	Guided group tour	4	2.00%
	TOTAL	200	100.00%
9) Source of info about DWP:	Friend introduction	76	39.20%
	Internet	67	34.50%
	Television	29	14.90%
	Newspaper	16	8.20%
	Magazine	4	2.10%
	Travel Agent	2	1.00%
	TOTAL	194	100.00%
10) Purpose of travel to DWP:	Relaxation	84	42.60%
	Closure with nature	45	22.80%
	Family trip	28	14.20%
	Bird watching	18	9.10%
	Friends outing	11	5.60%
	Photography	7	3.60%
	Learning about wetlands	4	2.00%
	TOTAL	197	100.00%
11) Satisfied with:	Closure with nature	143	54.37%
	Beautiful environment	80	30.42%
	Learning about wetlands	13	4.94%
	Service quality	12	4.56%
	Architecture style	6	2.28%
	Availability of activities	6	2.28%
	Restaurants quality	3	1.14%
	TOTAL	263	100.00%
12) Aspects of DWP that should be improved:	Park's infrastructure	68	24.91%
	Restaurants	63	23.08%

	Activity choice	60	21.98%
	Transportation	55	20.15%
	Service quality	20	7.33%
	Souvenirs and shopping	7	2.56%
	TOTAL	273	100.00%

13) Suggested development of DWP:	Fishing activities	75	42.40%
	Water games and activities	59	33.30%
	Big scale theme park rides	30	16.90%
	Sport activities	13	7.30%
	TOTAL	177	100.00%
14) Staying overnight:	Yes	119	59.20%
	No	82	40.80%
	TOTAL	201	100.00%
15) Accommodation type:	Local guesthouse	70	58.80%
	Economy accommodation	35	29.40%
	Luxurious Hotel	8	6.70%
	3 star hotel	6	5.00%
	TOTAL	119	100.00%
16) Overall satisfaction:	Very satisfied	30	15.40%
	Quite satisfied	90	46.20%
	Average	67	34.40%
	Not very satisfied	6	3.10%
	Very unsatisfied	2	1.00%
	TOTAL	195	100.00%
17) Reasons for protecting wetlands:	Bird sanctuary	95	34.05%
	Biodiversity	85	30.47%
	Landscape value	60	21.51%
	Water treatment	28	10.04%
	Carbon sequestration	11	3.94%
	TOTAL	279	100.00%
18) Will recommend DWP to friends:	Yes	156	78.00%
	Maybe	40	20.00%
	No	4	2.00%
	TOTAL	200	100.00%

Gender difference did not have any significant influence on majority of the answers, as in case of question concerning overall satisfaction and reasons for protecting wetlands. The only answer where man and women differed was the question of purpose of travel to Dongtan Wetland Park. Women were nearly twice more likely to come to park to enjoy family trip. This information could be used to in the marketing efforts of the park to promote the park as a suitable family trip destination.

There have been some differences in answer trends of different age groups. The data reveals a slight trend of satisfaction rates related to parks beautiful environment and closure with nature. Data suggests that the older the visitors the more satisfied they are with park's environment (landscape) and the younger they are the more satisfied they are with closure to nature. It could be argued that these seemingly similar answers are in fact different in their very nature. Beautiful environment refers to senses of esthetics while closure with nature refers to a more spiritual aspect of satisfaction. A cross-analysis of aspects of satisfaction and education levels has revealed a very similar trend. It seems as the satisfaction from the closure with nature becomes higher with each higher education level. On the other hand, satisfaction with landscape/environment beauty becomes higher for respondents in each lower education level. In conclusion, data suggests that the younger and the more educated respondents are the more satisfied they are with closure with nature and the older and less educated the more satisfied with beauty of landscape.

Visitors under 17 years old were the most satisfied group of all respondents. 58.3% of these young people have been overall very satisfied with their visit and 33.3% quite satisfied. The aspects of park that should be improved according to this age group were activity choice and parks infrastructure. Nearly 40% of the respondents in that age group suggested development of big scale amusement park rides, which was the highest answer rate for this type of development among all other age groups. Data reveals that the need of developing such infrastructure diminishes with each higher age group. 50% of respondents under 17 years old and 43.2% of those who identified themselves as students think that wetlands should be protected because of its importance as a bird sanctuary. It can be speculated that such a high answer rate among the youngest generation could be attributed to environmental education and communication activities that are available on the parks grounds and their apparent suitability for this age group.

Collected data shows correlation between overall satisfaction and education level. Respondents with higher education levels (bachelor degree and above) were on average more satisfied than the remaining groups. The exception to this trend is the group of respondents with less than high school education level that noted high satisfaction rates. Most of the respondents in this group were people below 17 years old and as it was shown above, they are one of the most satisfied groups of visitors. The place of residence has also shown correlation with the overall satisfaction. Respondents from Shanghai and external provinces have been on average more satisfied with their park visit than respondents from the three provinces directly adjacent to Shanghai; namely Jiangsu, Jiangxi and Zhejiang. All of the 6 foreign respondents that have participated in the survey evaluated their park experience as quite satisfactory. Respondents from Shanghai have mentioned all of the communication channels as the sources of information about the park while the other residence groups pointed to friend's introduction and internet as the only two sources of information. This is most likely due to the fact that Dongtan Wetland Park's marketing activities have been concentrating solely on Shanghai residents.

Age groups have shown some differences in their source of information about Dongtan Wetland Park. Respondents under 35 years old were more likely to get their information about the park from internet. Older groups over 45 years old were more likely to get their information from newspapers and TV. Students and retired people differ substantially in their preference of information source. This data can be used in preparing tailored communication campaigns for each of the two age groups.

3.3. Communication Strategy Planning.

The results gathered through the interview with Mr. Zhu the Vice Director of Marketing Department of Dongtan Wetland Park show that the park management is making use of majority communication tools that have been selected and reviewed in this research (Table 5). Park is actively undertaking activities in fields of marketing, public relations, branding, fund rising, environmental

education and conflict management. Stakeholder management and internal capacity building have not been so far adequately applied in the park management. Additionally, the park does not have a clear communication strategy that encompasses and coordinates all of their communication activities.

Table 5: Communication activities.

What communication activities are being undertaken by the park?	
Marketing of park products and services:	Yes
Fund rising, funding application/documentation preparation:	Yes
Public relations, mass media content development:	Yes
Branding, park culture and image development:	Yes
Environmental education activities:	Yes
Conflict management:	Yes
Internal trainings for staff in personal communication skills:	No
Stakeholder management:	No

Marketing activities of Dongtan Wetland Park have been concentrating on the product, price and promotion. Product placement (Jurin, 2010), understood in this context as availability and accessibility of park’s entrance tickets, has been limited mainly to one place, namely; ticket counter at park’s entrance. As it is shown in the results of park visitor survey only 2% of respondents have traveled to park as part of a tourism agency’s guided tour. If the management of Dongtan Wetland Park wants to increase the number of guided travel groups, it is recommended to improve the cooperation with tourism agencies. Greater cooperation with those agencies will not only increase the numbers of well organized groups but will also benefit the environment by decreasing amount of CO2 that is produced by the visitors when traveling in busses as opposed to private cars.

Branding has been an important part of park’s planning and operations. Learning from the experiences of *Low Tatra National Park* (NAPANT, 2007) it could be suggested to increase park’s brand visibility by placing park logo on the directing panels situated on the roads of Chongming Island if existing regulations allow. This approach would not only help to improve park’s brand recognition but might also make it more convenient for the travelers to find the park itself. As the survey results show 20% of respondents expressed their dissatisfaction with transportation to the park. The cross-analysis suggests that over 60% of respondents that were dissatisfied with transportation were driving their private cars. It could be assumed that the dissatisfaction is attributed partially to the poor visibility of guiding panels. Placing a clear uniform Dongtan Wetland Park’s logo on those panels might improve their visibility and consequently ease the difficulty of finding the park. Overall, branding can be a useful communication approach for sustainable development of nature conservation projects (M. Woodland & T.G. Acott, 2007).

Public relation activities have played an important role in operations of the park. They have been targeted mainly at governmental leaders, general public, tourists and business enterprises. It would be beneficial to know more about those groups and on their perception of Dongtan Wetland Park’s image and brand. This data could be collected and analyzed with the support of stakeholder management tools as surveying. Gathering the data on and feedback of those groups would allow tailoring more effective communication strategies and could improve the image of Dongtan Wetland Park among those groups.

Fund raising activities of the park have concentrated on one stakeholder group, namely business enterprises. *Guidelines for Tourism in Parks and Protected Areas of East Asia* (Eagles, 2001) suggests that some of the viable sources of funding in East Asia can include government budgets, grants from nonprofit organizations and international environmental institutions. It might prove worthwhile for the Dongtan Wetland Park to consider other sources of funding and not to concentrate solely on business enterprises.

Environmental education is one of the aspects that park management has been actively working on in recent years. Dongtan Wetland Park is currently applying to Shanghai Science and Management Institute to become an officially listed base for education. If this can be achieved, Dongtan Wetland Park would gain an opportunity to invite more schools to organize trips for their students to the park. If environmental education activities of this type are to be effective and efficient it will require good planning and preparation in the field of internal capacity building to assure availability of qualified guides. It will also require tailored marketing to assure many schools would participate in those environmental education activities. In the field of environmental education and interpretation targeted at all groups of visitors, Dongtan Wetland Park provides a number of displays and exhibitions. According to Elcome (1999), focusing on “flagship species,” can increase the overall effectiveness of environmental education activities undertaken by nature conservation area. Dongtan Wetland Park has been proudly promoting its engagement in bringing the endangered Yangtze River alligator to its natural habitat. It could be beneficiary to further accentuate this involvement in order to improve the effectiveness of park’s environmental education objectives. Recognizing Yangtze River alligator as one of the park’s “flagship species” could also improve the image of park among all stakeholders if properly incorporated in marketing, public relations and branding activities (M.J. Walpole & N. Leader-Williams, 2002).

Conflict management actions undertaken by the management and personnel of Dongtan Wetland Park were mainly related to inappropriate behavior and activities of visitors and local community on the park grounds. As it has been explained by Mr. Zhu, in case of bird hunting, individuals that were involved in such illegal activity have been handed over to authorities for legal investigation. We could try to see bird hunting as a conflict of interests between park’s objectives of nature protection and local community’s need to ease its economic pressures. Richard Jurin suggests that it is essential to “develop options for mutual gain by all parties involved” (Jurin, 2010) to achieve a successful resolution of a conflict. It could prove to be beneficial to involve and employ greater number of people from local community. Not only would it ease the economic pressures of households in the neighboring community, but it would also improve the public relations and image of Dongtan Wetland Park among this stakeholder group. If Dongtan Wetland Park is seen by the local community in positive light, then the nature conservation principles that it stands for will gradually influence the attitudes of local people.

Internal capacity building in the form of trainings for park’s staff has not been applied in the operations of Dongtan Wetland Park. Communication skills and techniques are considered to be an important tool in improving not only communication processes within the institution (NAPANT, 2007), but also the communication with main stakeholder groups (IUCN-CEC, 2011). Organizing trainings in personal communication skills for the different groups of personnel could improve the operations of Dongtan Wetland Park as well as its relations with important stakeholders. Visitors and general public have been identified as a crucial stakeholder groups for Dongtan Wetland Park. Park staff communicates with general public as potential visitors through TV and radio broadcasts, newspaper and magazine articles, posters, websites and social networks. Success of those communication activities, especially when interviews are involved, depends very often on the skills of individual managers. The personnel of Dongtan Wetland Park interact with visitors and can have a great impact on the overall satisfaction of visitor’s experience. According to the results of the visitor survey, 7% of respondents have suggested that park’s service quality needs further improvement. Even though this number relatively low, a significant improvement in this field could be achieved at a low expense.

Stakeholder management activities understood as identifying, collecting data and analyzing stakeholder groups had not been incorporated in the operations of Dongtan Wetland Park in the past. This research is the first attempt devoted to identifying, collecting and analyzing data on one of the crucial stakeholder groups for Dongtan Wetland Park. When planning communication, it is crucial to know your audience (Jurin, 2010; Robinson, 2003; WHO, 2008; Akpinar-Elci Muge, 2011). Information about stakeholders can be used in all communication related activities of Dongtan Wetland Park. It could be used to plan targeted marketing and public relation campaigns, in planning brand development, education, fund raising as well as resolving conflicts. The willingness of Dongtan Wetland Park's management to participate in interview conducted as part of this research and the enthusiasm and support in organizing the first park visitor survey shows great devotion in applying stakeholder management techniques in its operations.

4. Conclusions

The purpose of this research was to review the existing tools of communication and their practical application in a nature conservation project in Dongtan Wetland Park located on Shanghai's Chongming Island. Dongtan Wetland Park is actively searching for efficient management and operations techniques to balance the goals of nature conservation with the business model tourism activities that provide indispensable funding for its operations. Key person interview approach was applied to identify the main stakeholders in park's operations. Results suggest that tourists are a crucial stakeholder group for the sustainable operations of Dongtan Wetland Park. The second part of the research focused on collecting and analyzing data on this crucial stakeholder group. The park visitor survey undertaken in cooperation with park's management has allowed first insight into the profile of this crucial stakeholder group. The data gathered from this survey provides an indispensable source of information about park visitors and can be used to properly tailor future communication strategy. Being the first reliable source of information about park's visitors, the survey data will serve as a baseline for future endeavors of this type. This baseline will allow assessments of changing trends among the visitors and give direction to parks future operations, management techniques and development. The survey provided a quantifiable data that can now be used by Dongtan Wetland Park to adjust aspects of the park's management, service and infrastructure to improve park's brand and image, overall satisfaction of the park visit experience, develop more efficient and effective environmental education techniques and allow undisturbed financial operations of this nature conservation project by assuring a stable visitor count. It has been argued in this research that environmental communication provides many useful tools that can greatly improve the effectiveness and efficiency of parks operations and management.

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AUTHOR

Lukasz Madrzynski – Doctoral Program, College of Environmental Science and Engineering, Tongji University, Shanghai, China.
lukasz.madrzynski@yahoo.com

Foreign Direct Investment, Non-Oil Exports and Economic Growth in Nigeria: Granger Causality Approach

Aderemi Timothy Ayomitunde *, Aberu Felix **

* Department of Economics, Olabisi Onabanjo University, Ago Iwoye, Ogun State, Nigeria

** Department of Economics, Tai Solarin University of Education, Ijagun, Ijebu Ode, Ogun State, Nigeria

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Abstract- This paper critically examined the relationship between FDI, non-oil exports and economic growth in Nigeria using granger causality approach. The study utilized data from CBN Statistical Bulletin and UNCTAD investment report from 1980-2016. Consequently, various diagnostic tests such as unit roots, co-integration and Pairwise Granger Causality Tests were estimated. The results of the finding show that unidirectional causality runs from FDI to economic growth as well as non-oil exports. Hence, the study concludes that FDI has potential to propel the expansion of non-oil exports in particular and economic growth in general in Nigeria. Therefore, it is recommended in this paper that all hands must be on deck by the policy makers to create friendly economic policies and business environment that will boost further attraction of FDI into non-oil sector of the Nigerian economy.

Index Terms- FDI, Non-oil Exports, Economic Growth and Granger Causality

I. INTRODUCTION

In the last three decades, various attempts have been made by scholars and policy makers to classify foreign direct investment (FDI) in both developed and developing economies. For instance, World Bank, 2005 classified FDI as investment incurred in order to acquire a lasting management interest of 10 % of voting stocks and at least of equity shares in an enterprise operating in another country(ies) other than that of investors' country(ies)

Meanwhile, It has been established in the literature that the advent of oil in 1958 and the oil boom of 1970s sparked off rapid inflows of FDI in Nigeria, as a result of this scenario Nigerian economy has been tagged a mono-cultural economy depending heavily on crude oil products as her only major source of getting foreign earnings. This has made the economy to be very volatile to external shocks over the time. (Enoma and Mustafa, 2011).

It is worth of note that the recent catastrophic aftermath effects caused by the over dependency of the economy on a single products for revenues have necessitated the advocacy in some quarters by academics and researchers for diversification of the economy towards the direction of non-oil exports trade. One

of the popular arguments put forward by these scholars is that the non-oil exports have great potentials to propel Nigerian economy to the desired growth and development. (Onwualu, 2012).

However, over the last two decades, the persistent rise in financial market integration in the global economy orchestrated by the continuous participation and cross border distribution of multinational corporations and their activities as served a veritable factor that catalyzed foreign direct investment (FDI) to become the main source of foreign capital inflows to Africa, which has overridden overseas development assistance (ODA) in terms of size. Similarly, FDI contributed 20% of fixed capital formation in Africa over the last decade. However, this distribution has been observed to be unevenly distributed across African countries in general and sectors in particular, in which 15 oil-rich countries accumulated about 75% of FDI inflows (ADBetal, 2011).

Consequently, Nigeria being the highest oil exporter in Africa has attracted substantial FDI over time as part of its investment policy for economic development. The UNCTAD World Investment Report 2006 shows that FDI inflows to West Africa is mainly dominated by inflows to Nigeria, who attracts 70% of the sub-regional total and 11% of Africa's total. Out of this Nigeria's oil sector alone receives 90% of the FDI inflow. The current issues of globalization triggered by the cross-border investments, amalgamation of capital, mobility of knowledge, and advent of information and digital technologies has been identified as a veritable factor that stimulates FDI inflows into Africa in general and in Nigeria in particular. The paramount reason for this study lies in the compelling need to discover other feasible and profitable sectors of the economy in which oil and gas can be diversified to in order to ensure balanced sectoral, industrial and geographical development, which may serve as a catalyst for achieving sustainable economic growth in the years spanning up to 2030.

In view of the above scenario, it is therefore of great importance in this paper to examine the relationship between FDI, non oil exports and economic growth using granger causality approach. The scope of the study ranges between the periods of 1980 to 2016. It is assumed that 36 years are long enough for multiplier effects of FDI and non oil exports to transmit to growth of the economy.

II. LITERATURE REVIEW

Introduction

This chapter of the study reviewed related theoretical literature, then empirical literature from Africa and Nigeria on FDI, non-oil exports and economic growth.

2.1 Review of Theoretical Literature

The theoretical foundation for this study lies on the following theories which are reviewed as follows.

2.2 Theory of Multinationals

The theory of multinational was first put forward by Hymer in 1959 in his doctoral seminar published posthumously in 1976. He articulates that a firm whose operations cross national and cultural boundaries and a firm whose operations are only limited to one nation face different costs of production. In order for a firm to survive the presumed cost disadvantage orchestrated by the extra-costs, it must have internal firm-specific advantages over its rivals in the market. Such advantages are mainly captured by economies of scale or of superior production technology.

2.3 Traditional Neoclassical Growth Theory

Traditional neoclassical models of growth have been conceptualized as a direct outgrowth of the Harrod-Domar and Solow growth models, which both emphasize the importance of investment in an economy. The Solow neoclassical growth model in particular expanded the Harrod-Domar model by including a second factor input, labour and introducing a third independent variable technology, to the growth equation. Harrod-Domar model has a fixed coefficient, constant returns to scale, but the assumption of the Solow's neoclassical growth model exhibits diminishing returns to labour and capital independently and constant returns to both factors concurrently.

Empirical Literature Review

The following empirical studies show a number of ways through which trade flows, FDI and economic growth can be linked. Goldberg and Klein (1998) assert that FDI may encourage export promotion, import substitution, or greater trade in intermediate inputs which often exist between parent and affiliate producers. The compelling reason why most multinational firms invest is geared towards exports and this may most likely serve as a catalyst for the integration of the FDI host economy to the rest of the world.

Author(s)	Year	Study&Countries	Methodology	Results&Conclusion
Borensztein, De Gregorio and Lee	(1998)	FDI, Technology transfer and economic growth in developing countries.	Endogenous growth of technology transmission.	Technological advancement propelled long-run growth.
Akinlo.	(2003)	Effect of FDI in Africa	Pooled annual data from twelve African countries	FDI primarily affects economic growth via capital accumulation, as opposed to increasing productivity
Offiong and Atsu	2014	The determinants of FDI in Nigeria	Multiple regression analysis	The significant determinants of FDI are GDP and real wage rates
Zakia and Ziad	2007	FDI and economic growth of Jordan	VAR Modelling	Bi-directional causality exists between FDI and output, and between imports and output as well.
Saibu and Akinbobola	(2014)	Relationship among globalization, FDI and economic growth in selected SSA countries	Error correction modeling (VECM) approach	Study conclude that external shocks from capital inflows and trade inflows could be as a result of fluctuations in real economic growth in the SSA countries.
UNACA	2009	Key determinants of net FDI inflows in Africa	Panel data of 31 African countries, adopting both baseline static and dynamic panel data models	Study confirms that significant drivers of inward FDI in Africa are market size, past levels of inward FDI, corruption, domestic credit, share of oil in exports and religious

				tension risk.
Oyinlola	1995	The relationship between foreign capital to include foreign loans, direct foreign investments and export earnings in Nigeria	Using Chenery and Stout's two-gap model Chenery and Stout, (1966),	The study concludes that FDI has a negative effect on economic development in Nigeria.
Adelegan	2000	The impact of FDI on economic growth in Nigeria	The seemingly unrelated regression model	The study finds out that FDI is pro consumption and pro-import and inversely related to gross domestic investment
Ayanwale.	2007	The relationship between non-extractive FDI and economic growth in Nigeria	Using OLS estimates,	The paper discovers that FDI has a positive link with economic growth but cautioned that the overall effect of FDI on economic growth may not be significant
Efobi and Osabuohien.	2011	Agricultural credit guarantees scheme fund and non-oil exports performance in Nigeria spanning from 1970 to 2007	using the Vector Auto-Regressive (VAR) technique	The study establishes that there exists a long-run relationship between the ACGSF and export, but the magnitude is minimal.
Onodugo, Ikpe and Anowor..	2013	The specific impact of the non-oil exports to the growth of Nigerian economy between 1981 and 2012	Using Augmented Production Function (APF), and the Endogenous Growth Model (EGM) in its analysis. The conventional tests for mean reversion and co-integration were employed	The findings of the paper reveal a very weak and infinitesimal impact of non-oil export in influencing rate of change in level of economic growth in Nigeria.
Abogan, Akinola and Baruwa.	2014	investigate the impact of non-oil export on economic growth in Nigeria between 1980 and 2010	Ordinary Least Square Methods involving Error correction mechanism, over-parametization and parsimonious were adopted	The study shows that non-oil exports and economic growth are co integrated

Source: Authors` compilation, 2018

However, from the reviewed empirical studies above, virtually all the studies are in agreement that there is a relationship between FDI, non-oil exports and economic growth. But, there are a lot of augments and controversies in the type and kind of relationship that exists among these economic variables in Nigeria. This shows that literatures are still inconclusive about the way FDI and non-exports affect economic growth.

III. METHODOLOGY

Introduction

This study makes use of secondary data from 1980 to 2016. The data on GDP and non-oil exports are sourced from Central Bank of Nigeria Statistical Bulletin. Meanwhile, data on FDI are sourced from UNCTAD database published by World Bank. VAR modeling was estimated using E-Views software.

3.1 Model Specification

In analyzing the Granger causality between FDI, non-oil exports and economic growth, this work employed pairwise granger causality analysis in estimating the VAR model in equation (1-3) which stated thus; following Anoruo and Ahmad (2001), the model can be specified thus:

$$\begin{aligned}
 GDP_t &= \alpha_0 + \sum_{i=0}^p \alpha_1 FDI_{t-1} + \sum_{i=0}^p \alpha_2 NOIL_{t-1} + \sum_{i=0}^p \alpha_3 GDP_{t-1} + \varepsilon_{1t} \\
 &\text{----- 1} \\
 FDI_t &= \beta_0 + \sum_{i=0}^p \beta_1 FDI_{t-1} + \sum_{i=0}^p \beta_2 NOIL_{t-1} + \sum_{i=0}^p \beta_3 GDP_{t-1} + \varepsilon_{2t} \\
 &\text{----- 2} \\
 NOIL_t &= \gamma_0 + \sum_{i=0}^p \gamma_1 FDI_{t-1} + \sum_{i=0}^p \gamma_2 NOIL_{t-1} + \sum_{i=0}^p \gamma_3 GDP_{t-1} + \varepsilon_{3t} \\
 &\text{----- 3}
 \end{aligned}$$

3.2 The Direction of Causality between FDI, Non-Exports and Economic Growth in Nigeria.

This section addresses the objective of this paper which is to investigate the causal relationship among foreign direct

investment, non-oil exports and economic growth in Nigeria. Although regression analysis deals with the dependence of one variable on another variable with a view to estimating or predicting the value of the former variable in term of fixed value of the latter, this does not necessarily imply causality. In other words, the existence of a relationship between variables does not prove causality or direction of influence. However, in a regression analysis which includes time series data, the situation may be somewhat different. This is because time does not run backward. That is, if event A happens before event B, then it is possible that event A is causing event B. in other words, events in the past can cause events to happen in the present but future events cannot.

To provide the desired empirical basis for investigating the existence of causal relationship among foreign direct investment, non-oil exports and economic growth, this section adopts Pairwise Granger Causality Test

IV. RESULTS AND DISCUSSION

Table 1; Unit Root Test

Variables	Augmented Dickey-Fuller Test			Phillip Perron Test		
	Level	1 st Difference	Remarks	Level	1 st Difference	Remarks
LRGDP	-2.4613	-6.4450*	I (1)	-2.3141	-11.8522*	I (1)
LNN_OIL_EXP	-2.0804	-7.5905*	I (1)	-2.0438	-9.7350*	I (1)
LFDI	-0.2958	-10.8467*	I (1)	-0.9494	-10.7761*	I (1)

Source; Authors` computation (2018), note: */ **/ *** represent stationary at 1, 5 and 10 percent level respectively.

Due to the significance of the unit root in determining the cointegration and causality analyses, the variables in this study was tested for unit roots via the standard Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The standard ADF test was conducted for unit roots in the levels (for constant without trend) and first difference (for constant without trend); the result is reported in Table 1. Although, the test was started with level, the result showed a consistent results by rejecting the null (Ho: a unit root) hypothesis of a unit root at first difference, against the one-sided alternative whenever the ADF statistic is less than the critical value, at a statistically significant values of 1%, 5% and 10%. Hence, the variables of LRGDP, LNN_OIL_EXP and LFDI are stationary. Similar to the ADF test, PP test, for the country's LRGDP, LNN_OIL_EXP and LFDI, was conducted for unit roots in the levels (for constant without trend) and first difference (for constant without trend). The results, as reported in Table 1, presumed a rejection of null (Ho: a unit root) hypothesis of a unit root at first difference, against the one-sided alternative whenever the PP test statistic is less than the test critical values at a statistically significant values of 1%, 5% and 10%. This furthered confirm the result of ADF test.

3.3: Johansen Cointegration Test

TABLE 2: Johansen Cointegration Test (Trace Statistics)

Null Hypothesis	Eigenvalue	Trace Statistics	P-value
r=0	0.490363	32.30326	0.0252
r≤1	0.279550	10.73346	0.2284
r≤2	0.007512	0.241304	0.6233

Source; Authors` computation (2018)

TABLE 3: Johansen Cointegration Test (Maximum Eigenvalue)

Null Hypothesis	Eigenvalue	Maximum Eigenvalue	P-value
r=0	0.490363	21.56980	0.0434
r≤1	0.279550	10.49215	0.1816
r≤2	0.007512	0.241304	0.6233

Source; Authors` computation (2018)

The multivariate cointegration technique developed by Johansen & Juselius (1990) was employed to determine the long run relationships between the variable of LRGDP, LNON-OIL EXPORT and LFDI, since the variables in the systems was I(1), and may possess some kind of long run relationship. The test results are reported in Tables 2 and 3. The results of the

multivariate cointegration analysis reported in Table 2 and 3 indicated the existence of one cointegrating vectors in the systems. Based on the trace statistics, we observed from the results that there is one cointegrating vectors in the model (at a lag interval of 1 to 1. Similarly, the maximal eigenvalue statistics

in the table indicated the existence of one cointegrating vectors. This implies that the variables have long run relationship with one another may likely adjust to short run disequilibrium via one channels.

Table 4: Pairwise Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
LNN_OIL_EXP does not Granger Cause LRGDP	32	0.86591	0.4320
LRGDP does not Granger Cause LNN_OIL_EXP		5.53951	0.0096
LFDI does not Granger Cause LRGDP	32	5.89856	0.0075
LRGDP does not Granger Cause LFDI		0.25464	0.7770
LFDI does not Granger Cause LNN_OIL_EXP	32	4.85823	0.0158
LNN_OIL_EXP does not Granger Cause LFDI		0.27018	0.7653

Source: Authors` computation (2018)

The Granger causality test was conducted to determine the direction of causality among FDI, non-export and economic growth in Nigeria, the table reveals that causality runs from economic growth to non oil export, with F-statistic value of 5.5395 and p-value of 0.0096, thus the null hypothesis of no causality was rejected, while non oil export does not granger cause economic growth, This implies the existence of unidirectional causality from economic growth to non oil export. FDI does Granger cause economic growth at 5 percent level of significance, while economic growth does not Granger cause FDI, this implies the existence of one way causality flows from FDI to economic growth. Thus, the study confirmed the Harrod-Domar and Solow growth models, which both emphasized the impact of investment in an economy as a veritable factor that precedes economic growth. FDI Granger causes non-oil exports but non-oil exports Granger cause not FDI. In fact, the causality test illustrates a unidirectional causal relationship that runs from FDI to non-oil exports.

3.4 Conclusion and Recommendation

Attempt has been made in this study to examine relationship between FDI, non-oil exports and economic growth in Nigeria over the period of 1980 to 2016 using Granger causality approach. The study sets out to establish among others, the causal relationship that exists among FDI, non-oil exports and economic in the country within the studied period. To achieve the stated objective, the study follows this pattern: in the introductory chapter, the necessary background is laid; the problems are identified and justified accordingly. In chapter two, a critical review of the selected and relevant literature was done with a view to identifying research gap in the existing knowledge. The review shows that empirical studies have generated mixed results in the literature regarding the impact of FDI and non-oil exports on economic growth in Nigeria. Also, the direction of causality between FDI, non-oil exports and economic growth has not been adequately explored in Nigeria. Furthermore, while chapter three presents the model specification and estimates the series data based on the variables presented in

the model, by first examining the unit root test before the long-run relationship of the variables was investigated. Also, in order to empirically examine the causal relationship existing among FDI, non-oil exports and economic growth, Pairwise Granger Causality Test was conducted. It was discovered that unidirectional causality runs from FDI to economic growth as well as non-oil exports. This finding is line with the work of Olayiwola and Okodua, (2010). Similarly, one way causality runs from economic growth to non-oil exports. From the findings that emerged in this study, it is paramount that the following vital policy implications are drawn. FDI has facilitated the expansion of non oil exports in particular and economic growth in general in Nigeria over time. Therefore, the study thereby recommends that all hands must be on deck by the policy makers to create friendly economic policies and business environment that will boost further attraction of FDI into all sectors of the economy. Promotion of a stable political and macroeconomic environment that encourages investment, particularly foreign direct investment should not be overemphasized

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AUTHORS

First Author – Aderemi Timothy Ayomitunde
Aderemi.timothy@gmail.com

Department of Economics, Olabisi Onabanjo University, Ago Iwoye, Ogun State, Nigeria

Second Author – ABERU Felix, aberuf@tasued.edu.ng
Department of Economics, Tai Solarin University of Education, Ijagun, Ijebu Ode, Ogun State, Nigeria

A study on making complete feed blocks for cattle with different combination of fodder grasses and agricultural wastes

Sivajanani Santhiralingam¹, Jeyalingawathani Sinniah¹

¹Department of Animal Science, University of Jaffna, Jaffna, Sri Lanka.

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Abstract- Present study was carried out to develop a cost effective complete feed block with long shelf life using locally available fodder grasses and agricultural wastes. Three different complete feed blocks (T1, T2 and T3) were formulated to meet the daily requirement of 250kg heifers. Compacted blocks were formed in T1 and T2, while, T3 formed loose mass. The lowest ($P < 0.05$) free fatty acid content was observed in T2 while T3 had the highest. The highest ($P < 0.05$) dry matter, ash, ether extract, crude fiber and acid detergent fiber percentage were recorded in T1. Higher ($P < 0.05$) neutral detergent fiber, calcium and phosphorus contents were observed in T2 compared to T1 and T3. The highest ($P < 0.05$) crude protein and total digestible nutrient content were recorded in T3. The costs of production of T1, T2 and T3 to fulfil daily requirement of a heifer (250 kg) were Rs 130.55, Rs 149.75, and Rs 160.60, respectively. Based on the findings of this study, the feed block T3 found to be the best considering total digestible nutrient and crude protein contents but it failed to form the compact block, hence in the present form it is not suitable to make the complete feed block. Considering the shelf life and cost of production, the feed block T1 found to be the best. However, a feeding trial is required to evaluate the growth rate and feed conversion efficiency of heifers to select the best complete feed block.

Index Terms- Agricultural wastes, Complete feed block, Fodder grasses, Nutritive values

I. INTRODUCTION

The dairy industry is very important and has tremendous potential in developing the economy of the country (Jayaweera *et al.*, 2007). Inadequate feeding is one of the main reasons for sub-optimal productivity of the animals (Karangiya *et al.*, 2016). In Sri Lanka, about 98% of the smallholder dairy farmers neither cultivate nor conserve forage, but instead depend entirely on naturally available forage (Makkar *et al.*, 2012). Improper management of feed resources especially that of the bulky and fibrous crop residues is another factor contributing to low productivity of ruminant livestock in tropics. Use of these locally available feed ingredients can substantially reduce the cost of production of livestock. Suitable feeding practices and processing technology would enable the livestock farmer to utilize these resources more effectively resulting in better performance of the animals (Karangiya *et al.*, 2016). It is essential to strengthen these interventions without looking for other possibilities to increase local milk production.

In the recent years, the concept of feeding complete rations comprising of fibrous crop residues to dairy animals are popular among farmers. The role of complete ration is to provide a blend of the feed ingredients including roughages without giving any choice to the animal for selection of specific ingredient (Konka *et al.*, 2015). Complete feed blocks are solidified high density blocks comprising forage, concentrate and other supplementary nutrients in desired proportion capable to fulfill nutrient requirements of animals (Pankaj Kumar Singh *et al.*, 2016).

The technology also has the potential to provide complete feed to livestock under emergency situations created by natural calamities. Production of these types of feeds are very much important for enhancing the productivity of animals and for making use of the available low cost feed material. Therefore this research was carried out to check the feasibility of making complete feed blocks using fodder grasses, concentrates and other agricultural by-products as an economic animal feed and to evaluate the physical and chemical properties and shelf life of formulated feed blocks under Sri Lankan perspectives where the complete feed block is not popular among farmers and commercial livestock feed producers.

II. MATERIALS AND METHODS

Preparation of complete feed block

Three different complete feed blocks were formulated to meet the daily nutrient requirement of heifers on average weighing 250kg. The composition of the three different treatments are presented in Table 1.

All the raw ingredients were visually inspected and weighed according to the formulae. Straw was chopped into small pieces. Fodder grasses were harvested separately, cut into small pieces with grass cutter and dried under the shade to reduce the moisture content up to 10%.

In order to prepare the complete feed blocks the roughages and the mixture of concentrates and micro nutrients were mixed thoroughly with the binding agent of Palmyra molasses. The complete diets containing the roughages and concentrates at the ratio of 60:40 were subjected to the preparation of complete feed blocks at 2900psi in a compressed solid feed block making machine developed at the National Engineering Research and Development Center of Sri Lanka (NERDC), Ekala, Sri Lanka. Length and width of the blocks were 21cm x 21cm while the height of the block varied 9 -14 cm.



Figure 1: Compressed solid feed block making machine



Figure 2: Solid complete feed blocks

Table 1: Composition of the experimental complete diets (%)

Ingredients	Treatment 1	Treatment 2	Treatment 3
Rice bran	13.6	1.1	-
Coconut poonac	13.6	13.6	-
Mysore dhal husk	1.1	13.6	-
Cattle mash	-	-	28.3
Rice straw	40.8	29.5	-
<i>Gliricidia</i>	15.9	-	-
Sugar graze	-	27.2	-
CO-3	-	-	56.7
Molasses	10	10	10
Urea	1	1	1
Mineral mixture	2	2	2
Salt	1	1	1
Lime	1	1	1

Data collection

The physical and chemical properties and shelf life of the blocks were evaluated.

Chemical analysis

Composite samples were obtained from 10 random blocks of each treatment. The samples were dried, ground and sieved through 1mm sieve and used for chemical analysis. Percentage of dry matter, ash, crude fiber, ether extract, and crude protein were determined

according to Horwitz (2000). Percentage of Acid detergent fiber and Neutral detergent fiber were analyzed as per Soest *et al* (1991). Calcium and Phosphorus % of feed blocks also were determined according to Horwitz (2000).

Physical properties

Mean weight and thickness of complete feed blocks were determined. Durability percentage was determined by dropping three blocks of each treatment from a height of 2m on a concrete floor and the weight retention after the fall was used to estimate the durability%.

Shelf life

Moisture content and free fatty acid percentage as oleic acid were used to examine the keeping quality. In addition visual observation also was done for any change in appearance, color and the odour of the blocks with time.

Cost of production of complete feed blocks

Cost of production of blocks of different treatments was calculated based on the current market price.

Data analysis

Data were analyzed by ANOVA using SAS version 9 and means were separated by Duncan’s Multiple Range Test.

III. RESULTS AND DISCUSSION

Chemical composition

Table 2: Proximate composition of locally available agricultural wastes and fodder grasses

Feed stuffs	Dry matter (%)	Ash (%)	Crude protein (%)	Crude fiber (%)	Ether extract (%)
Concentrates					
Rice bran	90.07	8.1	9.44	13.69	7
Coconut poonac	87.94	7.1	17.5	15.39	11.1
Mysore dhal husk	89.03	3.4	14.44	22.29	8
Roughages					
Rice straw	89.36	9.8	5.56	36.19	0
<i>Gliricidia</i>	30.64	7.5	17.94	17.74	4.3
Sugargraze	12.78	10.5	10.94	32.23	5.97
CO-3	12.15	13.2	5.25	30.19	6.71

The estimated proximate compositions of the locally available feed stuffs are in par with the values reported by Ibrahim (1988) for the feedstuff in Sri Lanka (Table 2). Nutrient content of commercial cattle mash was about crude protein 16% (min), crude fat 4 % (min), crude fiber 10% (max), ash 12% (max), and moisture 12% (max) as per the leaflet distributed by the company.

Table 3: Percentage of total digestible nutrients (TDN) and digestible crude protein (DCP) of locally available agricultural wastes and fodder grasses (DM %)

Feed stuffs	TDN (%)	DCP (%)
Concentrates		
Rice bran	60.09	4.69
Coconut poonac	53.79	12.09
Mysore dhal husk	77.23	9.28
Roughages		
Rice straw	41.55	1.75
<i>Gliricidia</i>	71.36	12.48
Sugargraze	46.99	6.41
CO-3	48.05	1.49

The estimated TDN (%) and DCP (%) values of the locally available feed stuffs were in par with the values reported by Ibrahim (1988) under Sri Lankan condition (Table3).

Physical characteristics

Table 4: Physical characteristics of complete feed blocks

Complete feed block	Weight (kg)	Thickness (cm)	Durability (%)
Treatment 1	2.13± 0.25 ^b	8.9±1.60 ^b	91.32 ± 0.23 ^a
Treatment 2	2.29±0.33 ^b	12.20±1.92 ^a	84.63 ± 0.10 ^b
Treatment 3	3.16±0.25 ^a	13.6±2.07 ^a	6.36 ± 0.11 ^c

Note: Means within a column followed by same superscripts are not significantly different at $P < 0.05$

The differences in physical characteristics weight, thickness and durability are shown in Table 4. The highest and the lowest durability were observed for T1 and T3, respectively. The differences in the weight, thickness and durability may be attributed to the differences in the bulk density of the roughages and roughages cum concentrate mixtures. The differences in bulk density of natural grasses and concentrate mixtures were reported by Samanta *et al.*, (2003). In the present study blocks of uniform dimensions were not obtained, the thickness of the block differed among treatment. Current results are not in agreement with the results reported by Pankaj Kumar Singh *et al.*, (2016) in India where blocks of similar weight and thickness were obtained for different treatments.

Treatment 3 failed to form the compact block, it might be the reason for its least durability. According to the current study T3 is not suitable to make complete blocks. This may be due to not enough binder for effectively binding the concentrates and roughages and also may be of inadequate pressure created by the compressed feed block making machine, (Ben Saleem *et al.*, 2003). If the blocks are more durable it will be easier to handle them both in storage and transportation, (Munasik *et al.*, 2013).

Chemical properties

Table 5: Chemical composition (% DM basis) of three different treatments of complete feed blocks

Parameter	Treatment 1	Treatment 2	Treatment 3
Dry matter	90.53 ± 0.14 ^a	89.34± 0.58 ^b	86.61± 0.30 ^c
Ash	11.22± 0.12 ^a	9.68± 0.31 ^c	10.42±0.22 ^b
Crude protein	12.56± 0.16 ^c	14.59± 0.24 ^b	15.73± 0.12 ^a
Crude fiber	28.19± 0.83 ^a	24.76± 0.29 ^b	20.99± 0.62 ^c
Ether extract	5.47± 0.37 ^a	3.58± 0.33 ^b	4.34± 0.22 ^b
NDF	46.06± 1.18 ^b	49.19±0.94 ^a	38.82± 0.36 ^c
ADF	28.70± 0.32 ^a	27.94± 0.40 ^a	26.67± 0.32 ^b
Ca	0.98± 0.10 ^a	1.18± 0.17 ^a	0.58± 0.06 ^b
P	0.14± 0.03 ^c	0.91± 0.06 ^a	0.49± 0.05 ^b
TDN	65.35± 0.36 ^b	64.22± 0.46 ^b	65.68± 0.37 ^a

Note: Means within a row followed by same superscripts are not significantly different at $P < 0.05$

The dry matter percentage of complete feed blocks ranged from 87 to 91 (Table 5), these values are in agreement with the values (87-91%) reported by Kulathunka *et al.*, (2015) for different feed blocks. Nutritive value of the complete feed blocks ranged from 12.56 %

to 15.73% and 63.35% to 65.68% in terms of crude protein and total digestible nutrients, respectively. The crude protein percentage of Treatment 2 and 3 was in accordance with the values reported by Munasik *et al.*, (2013) in Indonesia who reported that crude protein % was between 13 -14% in the feed blocks made using concentrates and fodder grass Napier. Walli *et al.*, 2012 recommended a crude protein (CP) content of the block, varying from 7–14%, and the total digestible nutrients (TDN) content varying from 45–65% for dairy cattle of low producers to high producers. The TDN values obtained were in agreement with the findings of various authors Munasik *et al.*, 2013 (64- 65 %) and Buragohain *et al.*, 2013 (67 %).

In terms of the percentage of ash the treatment 1 had the highest ash content than the other two treatments. The ash content of the current study was higher than the values (7 to 8%) reported by Somasiri *et al.*, 2010, it may be due to the composition of blocks and the addition of mineral mixture to the complete feed blocks in the current study.

The incorporation of higher amount of straw may be the reason for the highest amount of crude fiber in T1 as the fibre content of straw is higher than the other roughages. The crude fiber values are in accordance with the values reported for different crop residue based complete rations by Kulathunga *et al.*, 2015 (28-31%).

Ether extract % of treatment 1 was significantly higher than the other two treatments. This may be due to the higher amount of rice bran in the treatment 1 than the others. The results of this study was higher than the findings of Kulathunga *et al.*, 2015 in Sri Lanka who reported that ether extract % of different feed blocks made using rice straw, rice bran, coconut poonac, molasses as main ingredients was between the range of 0.35 - 1.5 %. The higher value of ether extract of current study may be due to low level of straw and higher level of rice bran in the formulations.

Higher percentage of NDF % was obtained for treatments 1 and 2. This may be due to the incorporation of *Gliricidia* and sugar graze fodders in treatment 1 and treatment 2 respectively as the grasses contain high amount of fibrous materials. The results of the treatment 1 and 2 were lower than the results obtained by Pankaj Kumar Singh *et al.*, (2016) which ranges from 42- 76% for feed blocks which also made using concentrate mixture and rice straw. Samanta *et al.*, (2003) also reported a range of 50 to 56% for complete feed blocks with natural grass and concentrate mixture which included leaf meal as well. But the value of treatment 3 was in agreement with Pankaj Kumar Singh *et al.*, (2016) of India who reported the NDF % for concentrate feed blocks was 42.8%. The National Research Council recommendations for NDF% in a diet is 25-33 % with minimum 21% coming from forages. The results of the present study were higher than the recommendation of NDF %. This may be due to higher fraction of mature leaves in the ration as stated by Schroeder, (2004).

In terms of ADF% treatment 1 and 2 had higher ADF% than treatment 3. The values obtained for treatment 1 and 2 were lower and the treatment 3 was similar the values obtained by Pankaj Kumar Singh *et al.*, (2016) in India. He stated that the ADF % for feed blocks made using roughages and concentrates was between the ranges of 21 to 55%. As the ADF level in feeds increase digestible energy levels decrease, (NRC, 2001). All three treatments in the current study had the lower side of the range which will not hinder the digestibility of complete feed blocks. Samanta *et al.*, 2003 reported around 33% of ADF for natural grass cum concentrate mixture complete feed blocks.

Calcium% of current study is in agreement with the finding of Kulathunga *et al.*, (2015) in Sri Lanka who reported a range of 0.74 to 1.45%. However the availability on the Ca in the formulated feed blocks are less than the requirement of the animal (1.3%), hence measures should be taken to increase the Ca content of the current diets.

In all diets the available P contentment was lesser than the requirement (1.3%). Kulathunga *et al.*, 2015 in Sri Lanka reported a range of 0.5 to 1% P for similar treatments.

Shelf life

Table 6: Moisture content and free fatty acid % of experimental feed blocks

Parameters	Treatment 1	Treatment 2	Treatment 3
Moisture content%	9.47± 0.14 ^c	10.66± 0.58 ^b	13.39± 0.30 ^a
Free fatty acid %	7.09± 1.47 ^b	4.10± 0.32 ^c	11.65± 1.31 ^a

Note: Means within a row followed by same superscripts are not significantly different at $P < 0.05$

The results showed that the treatment 1 had the lowest percentage of moisture content and treatment 3 had the highest (Table 6). Keeping quality will be reduced when the moisture content of feed is high (Hozhabri *et al.*, 2006).The down side of increasing moisture levels is that free and ‘unprotected’ water poses a significant threat to feed quality, as ideal conditions are created for rapid mould growth and the development of mycotoxins,(Heijden *et al.*, 2010).

Treatment 2 had the lowest free fatty acid percentage compared to the other two treatments of complete feed blocks whereas treatment 3 had the highest. Keeping quality was reduced when the FFA% of the feed is high. But with the proper packaging and controlling the

storage temperature, decomposing rate of oil could be reduced. The maximum limits of edibility vary according to the type of oil but a critical limit of 1% could be taken as a general guide for human food. 5% of FFA was considered as the critical FFA level of animals feeds in some studies, (Somasiri *et al.*, 2010). There was no visible change in colour, texture and no mould growth was noticed during a month of storage.

Cost of production

In order to prepare blocks for 250 kg heifers for a day, the cost of production of T1, T2 and T3 were Rs130.55, Rs149.75 and Rs160.60, respectively. The high cost of commercial dairy mash used as concentrate in T3 might have increased the cost of production of T3.

IV. CONCLUSION

Based on the findings with respect to TDN, and CP, T3 is the best one but it failed to form compact block. But according to durability and cost of production T1 is the best. However, a feeding trial is required to conclude the present findings.

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AUTHORS

1.
Sivajanani. Santhiralingam
Department of Animal Science
Faculty of Agriculture
University of Jaffna
Ariviyal Nagar
Kilinochchi
Sri Lanka
Email: jananisanthiralingam@gmail.com

2.
Jeyalingawathani. Sinniah
Department of Animal Science
Faculty of Agriculture
University of Jaffna
Ariviyal Nagar
Kilinochchi
Sri Lanka
Email: jeyalingawathani@gmail.com

Corresponding author:
Jeyalingawathani. Sinniah
Email: jeyalingawathani@gmail.com

Increasing cost efficiency through minimizing transformer losses: Design and performance analysis of a 250 kVA off-load tap changing step down transformer

Sairatun Nesa Soheli¹, Md Saidul Hasan², Md Refat Uddin³

^{1,3} Dept of EEE, IUBAT–International University of Business Agriculture and Technology

² Dept of EEE, Northern Science and Technology

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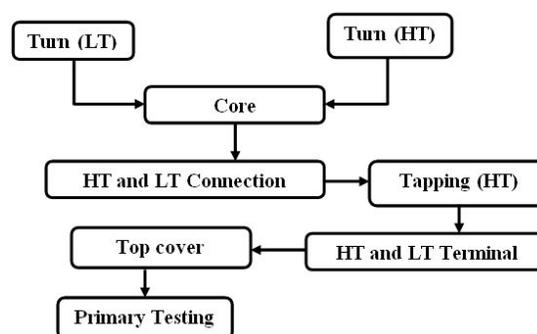
Abstract- A step down transformer can decrease the voltage level and increase the current level by keeping constant power and frequency which gives needful output to a substation. To get this require output transformer design should be splendid. This paper based on transformer design and analysis which can reduce copper and core losses with proficient cost. Step lop core lamination reduce no load voltage up to 8% no load current up to 50% with low noise level. Payback analysis will give the comparison between proposed designed transformer and normal designed transformer. For example: The electrical bill per year due to losses is around 1, 25, 356 bdt for proposed designed transformer rather than the normal transformer where the electrical bill per year due to losses is around 2, 34, 943 bdt and thus yearly saving due to energy efficient transformer is $(2, 34, 943 - 1, 25, 356) = 1, 09, 587$ bdt. By this way the huge amount of money will be saved by the consumer.

Index Terms- Design, inner connection, analysis, core design, payback analysis

I. INTRODUCTION

Before to start with a working design, a brief requirement of a 250 kVA, 11/0.415 kV copper-wound transformer has been conceived. The first step of the design is to select the number of turns of coils and continue further in the direction of estimating the coil construction, up to arriving at the window height of the core frame. Based on the calculated window height, the design of the secondary coil is done. After that, core diameter, limb center, step width, core stack, core area, flux density are calculated with the obtainable design output. The next step of design is the configuration of coils and limb center of the core frame. Based on the window height and limb center of the core frame, detailed design of core up to the weight of the absolute set of cores is estimated [1]. Manufacturing details of low and high voltage windings, placement of coils, internal clearances tapping and weight of conductor are done. Next step is that, calculation of performance figures. The procedure of calculation of resistance, ratio error, efficiency, losses, no-load current, percentage impedance, regulation have been dealt with. After the design of interior active part, the chapter has enclosed the process of tank design with different types of radiators. A small number of paragraphs have been added to established the procedure of designing the core frame part, core stud, tie rod, conservator etc. After that calculation of oil volume, overall weight and dimensions has also been discussed. The chapter ends with the procedure of filling up the guaranteed technical particulars with applicable calculation of performance parameters and generation of various drawings for submission. The thermal ability to withstand an external short-circuit has also been shown [2].

II. METHODOLOGY



- Determined number of turns of low and high tension side with core calculation
- Low and high tension side are connected by star and delta connection respectively

- Tap changer connected with high tension copper winding and determine the terminals of low and high tension side [3]
- Setting of two terminal by tap cover with initial testing

III. SPECIFICATIONS OF THE PROPOSED TRANSFORMER

- Rating 250 kVA; oil cooled
- No-load voltage ratio 11000/415
- No. of phase 3 Phase
- Frequency 50 Hz
- Winding material Electrolytic copper
- Tapping's on HV $\pm 2\%$ to $\pm 8\%$ (off circuit)
- No. load/load loss 450/2610 watt
- Impedance 5.5%
- Flux density 1.6 Tesla (max)
- Current density 2.6 A/sq. mm (max)
- Connection Delta/star, vector group Dyn 11
- Temperature rise 45/75°C
- Other specifications as per IS-2026
- High Tension (HT) = 11000 V
- Low Tension (LT) = 415 V
- Let, Current at low tension side, $I_{LT} = 347.80$ Amp
- Let, Current at high tension side, $I_{HT} = 13.12$ or 7.58 Amp

IV. BLUEPRINT OF THE PROPOSED TRANSFORMER

Copper is connected with high and low tension coil as well as the connection of high tension tapping diagrammatic concept given below:

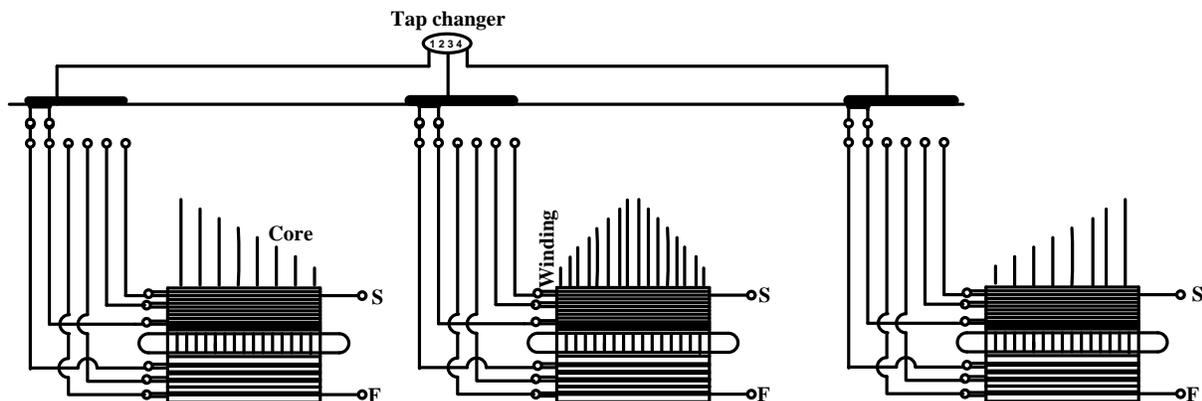


Figure 1: Blueprint of proposed design transformer

Here, 250 kVA of load tap changing transformer which have 5 tapping and here tapping 2 is the standard tapping position of the transformer. In this tapping 2 position we get the standard output result of transformer. High tension copper has to be connected with two parts in per phase because of proper oil circulation [4]. We can see that core is surrounded by the low tension coil and then this low tension coil is surrounded by the high tension coil. High tension coil connected with delta ways and low tension coil connected with star ways. For tapping purpose here the high tension coil starting part indicate by 'S' and finishing part of the coil indicate by 'F'. The first tapping start and finish are shorted that's why all winding are become connected and the result is that we get minimum voltage as an output in low tension side. Again the 5th tapping position the minimum winds are connected in a low tension side and thus we get maximum voltage as an output result on low tension side of a transformer [5].

V. PERFORMANCE ANALYSIS OF THE PROPOSED TRANSFORMER

A. LOW TENSION (HT) COIL CALCULATION

Connection: Star

$$\text{Per turn voltage, (V/T)} = (1 \div C) * \sqrt{(kVA * 1000) \div 3} \dots\dots\dots(1)$$

Here coefficient, C = 40 and kVA = 250

Now from equation (1);

$$(V/T) = (1 \div 40) * \sqrt{(250 * 1000) \div 3} = 7.21688 \text{ V}$$

$$\text{Voltage per phase, } V_p = (\text{low tension voltage} \div \sqrt{3}) = (415 \div \sqrt{3}) = 239.60 \text{ V}$$

Number of turn per phase, $T = (\text{voltage per phase} \div \text{per turn voltage})$
 $= (239.6004 \div 7.21688) = 33.2$

Number of turn of low tension side $= 33.2 * \sqrt{3} = 58$

B. HIGH TENSION (HT) COIL CALCULATION

Connection: Delta

Copper type: Bare

Number of parts = 4

Per turn voltage, $(V/T) = (1 \div C) * \sqrt{(kVA * 1000) \div 3}$ (2)

Here, coefficient, $C = 40$ and $kVA = 250$

Now from equation (1);

$(V/T) = (1 \div 40) * \sqrt{(250 * 1000) \div 3} = 7.21688 \text{ V}$

Voltage per phase, $V_p = (\text{high tension voltage} \div \sqrt{3}) = (11000 \div \sqrt{3}) = 6350.85 \text{ V}$

Number of turn per phase, $T = (\text{voltage per phase} \div \text{per turn voltage})$
 $= (6350.85 \div 7.21688) = 879.99$

Number of turn of high tension side $= 879.99 * \sqrt{3} \approx 1524$

C. IRON CORE CALCULATION

Core area $A_i = \frac{\text{Per turn voltage}}{4.44 * f * B_m * 0.92}$

Here, Frequency, $f = 50 \text{ Hz}$

Flux density, $B_m = 1.57$

So, $A_i = 0.022507 \text{ m}^2 = 22506.7 \text{ mm}^2$

Again, Core $A_i = \pi D^2 / 4$

So, $\pi D^2 / 4 = 22506.7$

Diameter, $D = 169.324 \text{ mm}$

Table 1: Usable core diameter rating

Core Diameter	163 mm
Number of turn in low tension side	32 T
Number of turn in high tension side	800 T

D. DETERMINE OF LOW TENSION COPPER SIZE:

Current at low tension side, $I_{LT} = 347.80 \text{ Amp}$

Copper current density $= 2.89 \text{ Amp/mm}^2$ (std)

Required cross section area $= \frac{\text{Current at low tension side}}{\text{Copper current density}} = \frac{347.80}{2.89} = 120 \text{ mm}^2$

Copper Size (mm)		No of wire along depth	No of wire along depth	Area (mm ²) A = 126 mm ²
Width	Thickness			
9	3.5	2	2	

Width
 Height

Now, $9 * 3.5 \text{ mm}$ copper may be used for low tension coil with damp proof course (DPC) is $9.5 * 4.0$

Determination of inner diameter (IO), outer diameter (OD), axial length (A/L) of low tension coil;

Core diameter (D) = 163 mm

Inner diameter (ID) = $(D + \text{press. thickness} * 2) = 170 \text{ mm}$

Outer diameter (OD) = $(ID + 2 * \text{low tension radial depth}) = 206 \text{ mm}$

Axial length (A/L) = $[(T' * NT) * (\frac{\text{Total number of turn}}{L})] + [(T') + \text{Pressboard width min}]$

Axial length of low tension $A / L_{LT} = 360 \text{ mm}$

E. DETERMINE OF HIGH TENSION COPPER SIZE

Current at high tension side, $I_{HT} = 7.58 \text{ Amp}$

Copper current density $\delta = 2.89 \text{ Amp/mm}^2$ (std)

$$\text{Required cross section area} = \frac{\text{Current at high tension side}}{\text{Copper current density}} = \frac{7.58}{2.89} = 2.621 \text{ mm}^2$$

Table 2: Copper size and area

Copper size		Area
Diameter(SWG)	Diameter (mm)	ATH (mm ²)
14	2.03	3.2349065

SWG is Standard Wire Gauge = 14 used for high tension coil

Damp proof course (DPC) copper size = 2.1 mm

Damp proof course (DPC) thickness = 0.07 mm

Here, $(11000 * \sqrt{3}) / 415 = 45.910$

Number of turn of high tension side = 1524

Determination of inner diameter (IO), Outer diameter (OD), Axial length (A/L) of high tension coil;

Total axial length, $(A/L)_{HT,T} = [(A/L)_{LT} - \text{gap for part coil}] = 322 \text{ mm}$

Single axial length, $(A/L)_{HT,S} = \frac{(A/L)_{HT,T}}{\text{no of parts}} = 80.5 \text{ mm}$

So, per layer turn, $T_p = \frac{(A/L)_{HT,T}}{\text{total copper size}} = 38$

Total calculated layer = $\frac{\text{turn per coil}}{T_p} = 9.8217391$

In practical no of layer = 10

Inner diameter (ID) = low tension outer diameter + gap between low tension and high tension coil = 245 mm

High tension outer diameter (OD) = inner diameter + (total copper wire diameter * 2 * no of layer) + oil duct (0) + leatheroid paper (5) = 292 mm

Axial length $(A/L)_{HT,S} = 80.5 \text{ mm}$

F. OVERALL CORE DESIGN OF 250 KVA STEP DOWN TRANSFORMER

Axial length, $(A/L)_{LT} = 360 \text{ mm}$

Window wide and height $(W/H) = (A/L)_{LT} + \text{clearance} = 360 + 25 = 385 \text{ mm}$

Core diameter, $D = 163 \text{ mm}$

1st stack = 30 mm

Core width = 160 mm

P to P distance = high tension outer diameter + clearance = 292 + 10 = 302

A Core length, $L_A = (\text{window wide and height} + 2 * \text{core width}) = (385 + 2 * 160) = 705 \text{ mm}$

B Core length, $L_B = (\text{window wide and height} + \text{core width}) = (385 + 160) = 545 \text{ mm}$

C Core length, $L_C = (2 * \text{P to P distance core} + \text{core width}) = 746 \text{ mm}$

X = $[C \text{ core length}, L_C - (3 * \text{core width})] / 2 = [746 - (3 * 160)] = 142 \text{ mm}$

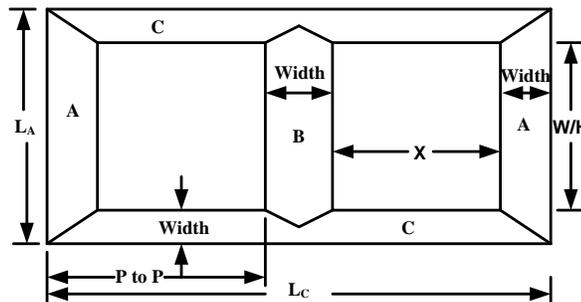


Figure 1: Limbed Core

PART A

Length of lamination (L) is calculated as $(W/H + 2W) \text{ mm}$, where W/H and W are in mm

Similarly, weight is calculated as $= 28 [(L - W) * W * \text{core stack} * \text{density} * 0.97 * 10^{-3}]$

Where L , W and core stack are in cm

Table 3: Core A cutting

Core A					
SI. no	L ₂	b	L ₁	Stack	Weight(kg)
1	385	155	700	60	40.09
2	390	150	695	40	25.62
3	395	145	690	27	16.93
4	400	140	685	22	13.03
5	405	135	675	18	10.62
6	410	125	665	30	16.21
7	415	115	655	24	12.07
8	420	105	645	20	9.02
9	425	95	635	17	7.08
10	430	85	625	14	5.42
11	435	75	615	12	4.11
12	440	65	605	10	3.05
13	445	55	595	9	2.19
14	450	45	585	7	1.51
15	455	35	580	6	0.97
Total weight = 139.18 kg					

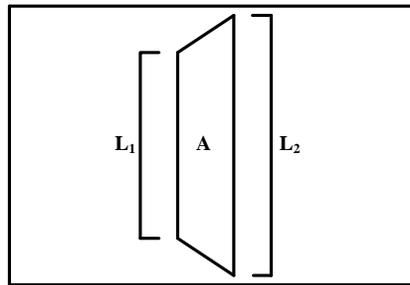


Figure 2: Core A cutting design

PART B

Length of lamination, L is calculated as $(W/H + W)$ mm; where W/H and W are in mm
 Similarly, weight is calculated as $= (L - 1/2 W) * W * \text{core stack} * \text{density} * 0.97 * 10^{-3}$ kg
 Where L, W and core stack are in cm

Table.4: Core B cutting

Core B					
SI. no	L ₂	b	L ₁	Stack	Weight(kg)
1	385	155	454	30	17.10
2	390	150	454	19.77	10.98
3	395	145	454	14	7.30
4	400	140	454	11	5.65
5	405	135	454	9	4.63
6	410	125	454	15	7.14
7	415	115	454	12	5.37
8	420	105	454	10	4.14
9	425	95	454	8	3.21
10	430	85	454	7	2.49
11	435	75	454	6	1.90
12	440	65	454	5	1.43
13	445	55	454	4	1.04

14	450	45	454	4	0.72
15	455	35	454	3	0.47
Core weight =60 and stack =154.04604					

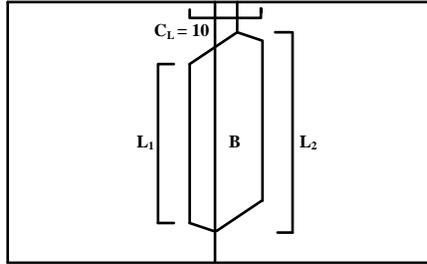


Figure 3: Design of B core

PART C

Length of lamination (L) is calculated as $(2 C/L + W)$ mm

Where C/L, W are in mm similarly

Weight is calculated as $= 2 * [(L - W) * W - 1/2 W^2] * \text{Core stack} * \text{density} * 0.97 * 10^{-3}$ kg

Where L, W and core stack are in cm

Length of 1st step = $(2 * 460 + 240) = 1160$

Weight of 1st step = $2 * [(116 - 24) * 24 - (\frac{1}{2} * 24)^2] * 6.248 * 7.65 * 0.97 * 10^{-3} = 191.38$ kg

Table 5: Core C cutting

Core B					
SI. no	L ₂	b	L ₁	Stack	Weight(kg)
1	225	155	715	60	38.53
2	130	150	710	40	24.72
3	135	145	705	27	16.42
4	140	140	700	22	12.70
5	145	135	695	18	10.40
6	155	125	685	30	16.03
7	165	115	675	24	12.04
8	175	105	665	20	9.27
9	185	95	655	17	7.19
10	195	85	645	14	5.56
11	205	75	635	12	4.25
12	205	65	635	10	3.18
13	205	55	635	9	2.31
14	205	45	635	7	1.60
15	205	35	635	6	1.04
Total core weight C= 145.70 kg					

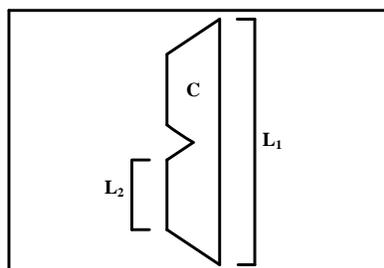


Figure 1: Design of core C

Total weight of core,
 Weight of Part A = 139.18 kg
 Weight of Part B = 60.04 kg
 Weight of Part C = 145.70 kg
 Total weight of core = 344.92 kg
 So, designed of 250 kVA step down transformers is strongly considering all losses as core and copper losses

Table 6: All losses are considered for design of transformer

Design validation sheet				
kVA	250	Voltage	11/415kV	+ 2.5% to - 7.5% in step of 2.5% Taping
SI. no	Description	Units	Guaranteed	Designed
1	No load loss	W	275	273.74
2	No load current	A	1% OF FL	-
3	Load loss	W	2650	2648
4	I ² R loss	W	-	2443
5	Stray loss	W	-	205
6	Impedance	%	4	4.08
7	Reactance	%	-	3.86
8	HV resistance @ 75°C	Ω	-	12.95
9	LV resistance @ 75°C	Ω	-	0.004373
10	Temp rise oil	°C	60	-
11	Temp rise wedge	°C	65	-
12	LV per coil weight	Kg's	-	23.0
13	HV per coil weight	Kg's	-	7.36
14	Total job weight	Kg's	-	1034

VI. TAP CHANGING PROCESS OF THE PROPOSED TRANSFORMER

Tap changing process is the process of selecting or cutting out a certain number of turns on the transformer winding thus obtaining a variable turns ratio. This is done in order to maintain the output voltage within desirable limits because the equipment works satisfactory in the power system [3]. According to the diagram, used 2.5 % tapping for the off load tap changing transformer for this reason output voltage might be five different values and thus from tapping one to tapping five voltage level increase respectively up to a certain position.

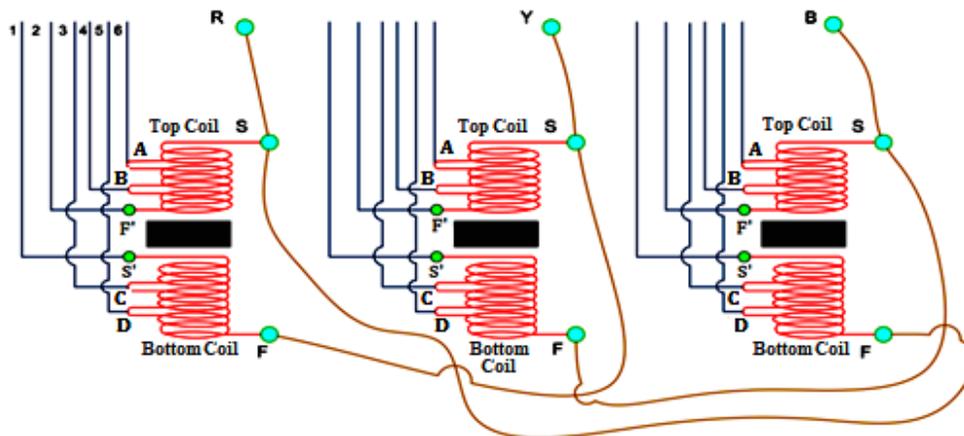


Figure 5: Off load tapping connection on 250 kVA transformer

Tapping calculation given below:
 For 250 kVA transformer used 2.5% tapping
 High tension coil number of turns = 1524
 So the tapping turns will be for 2.5% = $1524 * (2.5 / 100) = 38$ turns
 For better voltage control the total primary turns will be $(1524 + 38) = 1562 \approx 1600$
 High tension coil have two parts, one is top coil and another is bottom coil

So, within this 1600 turns the top coil have 800 turns and the bottom coil have 800 turns. The top coil tapping is given at the end of the turns and the three tapping connections for the top coil are given below:

Total Number of turns 800

Start of HT coil (S) = 0 turn

Finish of top coil (F') = 800 turns

Tapping point B = 800 – 38 = 762 turns

Tapping point A = 762 – 38 = 724 turns

The bottom coil tapping are given at the beginning of the turns and the three tapping connections for the bottom coil are given below:

Start of Bottom Coil (S') = 800 turns

Finish of LT coil (F) = 0 turn

Tapping point C = 800 – 38 = 762 turns

Tapping point D = 762 – 38 = 724 turns

VII. PAYBACK ANALYSIS OF THE PROPOSED TRANSFORMER

The payback period is the length of time required to recuperate the preliminary cash expenditure on the project. The proposed transformer has a proven and reliable design which ensures an economical life of the transformer for more than 20 years. The energy efficiency transformer reduces the electricity bill by reducing the total losses as shown in the following example:

Sl no	Payback analysis	250 kVA
1	Losses are considered for full load application (utilization factor)	1
2	Electricity charges considered per kWh (cost of Tk./unit)	4.5
3	Rating considered	250 kVA
4	No. of hours in a year (24 * 365)	8760

A	Proposed designed energy efficient transformer	
	No load loss + Full load loss	(0.360+2.82) kW
	Total load loss (kW)	3.18 kW

B	Normal designed ordinary transformer	
	No load loss + load loss	(0.56 + 5.4) kW
	Total load losses (kW)	5.96 kW

A ₁	Electricity bill per year due to losses for proposed transformer	
	Utilization (1) * price per unit (4.5) * total no of hrs (8760) * loss (22.6)	1, 25, 356 bdt

B ₁	Electrical bill per year due to losses (bdt)	
	Utilization (1) * price per unit (4.5) * total no of hrs (8760) * loss (35.6)	2, 34, 943.20 bdt

X	Yearly saving due to energy efficient transformer (B ₁ - A ₁)	1, 09, 587.00 bdt
P ₁	Approximate price of 250 kVA transformer	4, 00, 000.00 bdt
P ₂	Price of 250 kVA ordinary transformer	3, 30, 000.00 bdt
P ₁ -P ₂	Price difference for energy efficient design	70, 000.00 bdt
P _B	Payback period in year, $P_B = \frac{P_1 - P_2}{X}$	0.64 year
P' _B	Payback period in month = P _B * 12	7.6 month

VIII. RESULT

Manufacture of the transformer by using this design, core and copper losses are very low. It is also eco-friendly cause of the noise is very low and output voltage is 99% which reduce electric bills and gives long-lasting life. Core and copper calculations such an accurate that the economical transformer design cost becomes low. Payback and Resulting analysis are discussed in this paper robustly.

XI. CONCLUSION

In this paper agitated in regard to design hermetically sealed shell type oil immersed distribution transformers with minimum evaluated cost according to the IEC standards. Here very calculatedly describe about the transformer design with proper equations as well as the consequently core and copper design then internal total connection of the transformer. Distribution transformer model and design constraints are implemented as a user-friendly an objective function for total evaluated cost is optimized subjected to ten constraints according to IEC 60076 in addition to geometrical constraints. A design example on a 250kVA transformer is presented for illustration.

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AUTHORS

First Author – Sairatun Nesa Soheli, Senior Lecturer, IUBAT–International University of Business Agriculture and Technology, soheli@iubat.edu

Second Author – Md Saidul Hasan, Instructor, Northern Science and Technology, mdsaidulhasan2@gmail.com

Third Author – Md Refat Uddin, IUBAT–International University of Business Agriculture and Technology, rashedrefat@gmail.com

Correspondence Author – Sairatun Nesa Soheli, Senior Lecturer, IUBAT–International University of Business Agriculture and Technology, soheli@iubat.edu

Substance with which Soul May Be Made Off

S.C.Srivastava

Retired Scientist, CIMFR Dhanbad India

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I. THE PROPOSED MODEL

The author had proposed a model for soul (Jeev Atma in Hindu mythology) in his book¹ (Nature and manifestation of soul).

It was mentioned that the size of soul is very precise and cannot be seen by any instrument so far known in the field of science. It was further mentioned that the soul is not made of elements like hydrogen carbon sodium etc. Everything we see around us including our own body may be made of these elements. It was written at that stage that it is entirely different substance, more precise than normal elements.

It has been proposed now that the size of primary particles constituting soul may be of the order of micro pica meter to milli pica meter.

If we consider Einstein's equation

$$E = mC^2 \quad 1$$

Elements satisfy this equation. Now the logic is that why we can't think of particles much smaller than these elements. We may not be able to detect such particles by present day scientific instruments but may be detection of such small particles becomes possible in near or distance future. .

If we consider particles of the size of milli to micro pica meter they may have less energy but their existence may be assumed.

1. In the present model we have proposed combination of large number of such particles in a special way to be able to retain considerable memory and may be still smaller than milli pica meter.

2. It is also possible that these small particles are of several varieties like different elements but in such a small size as we have proposed. If it is found at a later date that the primary particles that we have proposed are of a few different types then the mysterious way of their combination may be easier to explain. In such a situation these may be forming different combinations like elements form molecules. In such a case it will be easier to write large amount of memory with the help of such imaginary combinations.

3. Several thousand such primary particles combine in a mysterious way to form soul. Such combinations may have special structure that may need to be worked out once these are possible to be detected by some machines.

Thus the size of soul consisting of large number of proposed primary particles may be of the order of milli pica meter or shorter. Such a size of soul would make soul smaller than these gaps mentioned in table 1 Appendix 1

Size of hydrogen nucleus as an illustration has been compared in table 2 Appendix 2

Let us considers the structure of matter that constitutes all things around us even our own body.

We see that there is a gap between elements placed in these structures. This structural gap between elements in a crystal lattice or intra or inter molecular space may be of the order of 300 to 600 pica meter.

Properties of primary particles forming soul.

The combination of primary particles forming soul may have the following properties:

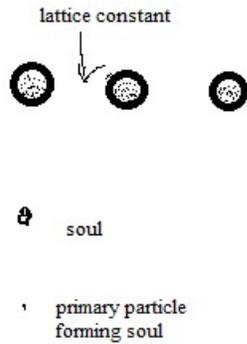
- i. It can retain memory of the past life or several past lives.
- ii. It can travel long distances with high speed
- iii. It can detect the place where the fertilized ovum exists.
- iv it can detect a dead body whose soul has vacated the body. Any roaming soul may enter this vacated body.
- v. It appears it has all the senses of a human being.

4. It appears that the same primary particle proposed above may combine in fairly large number to form various particles that constitute elements and associated particles like electron proton, neutron, neutrino, mason etc. Unless it is worked out fully it is difficult to pronounce such a theory. This would perhaps be an unaccepted conclusion at present.

Appendix 1
Table 1

Give size of primary particle soul and gap between molecules

Appendix 1
Table 1



Gap in atoms of all matter that we see around us wall windows

Fig 1

Appendix 2 Table 2

All sizes

Substance	distance in PicoM $10^{-12}M$
Hydrogen atom radii	53 pm
Lattice Constant	300-600 PM
Ms Sole unit matter	1 micro PM 10-18
Soul	1000 Pm
Human Female	
Ova fertilized	.15-.2 mm

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AUTHORS

First Author – S.C.Srivastava, Retired Scientist, CIMFR
 Dhanbad India

Effects of Fermentation and Extrusion on The Microbiological and Proximate Composition of Ripe Plantain and Groundnut Blend

Ojokoh A. O and Ajayi-Choco T

Department of Microbiology, Federal University of Technology, P.M.B. 704, Akure, Ondo State, Nigeria.

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Abstract- This study was designed to monitor the effect of fermentation and extrusion on ripe plantain and groundnut blends. The blended samples were prepared in five combinations (A=100% ripe plantain; B= 80% ripe plantain: 20% groundnut; C= 60% ripe plantain: 40% groundnut; D= 50% ripe plantain: 50% groundnut and E= 100% groundnut) and separated into four batches (i.e. first batch = preconditioned and extruded; second batch = fermented; third batch = fermented and extruded; and fourth batch = unfermented/unextruded. The blended samples were fermented for 96 hours in submerged state fermentation. The pH, temperature and total titratable acidity (TTA) of the fermented samples were determined. A total of fourteen microorganisms comprising 9 bacteria, 3 molds and one yeast were isolated and identified as; *Bacillus subtilis*, *B. cereus*, *B. polymyxa*, *Proteus mirabilis*, *Staphylococcus aureus*, *S. epidemidis*, *Lactobacillus plantarum*, *L. fermentum*, *Pseudomonas aeruginosa*, *P. fluorescens*, *Aspergillus niger*, *A. flavus*, *Fusarium oxysporum* and *Saccharomyces cerevisiae*. The pH and TTA values varied significantly with fermentation time. The temperature reduced significantly as the fermentation day increases. The fermented sample showed increase in moisture and crude fibre contents (32.6 and 17.5) in samples E and B while raw blend B and D had lowest values (2.19 and 0.66) when compared to the extruded samples. The carbohydrate and protein contents recorded the highest value (80.8 and 16.6) in Extruded fermented plantain 100% and extruded unfermented groundnut 100% respectively. Findings from this study demonstrated that ripe plantain and groundnut blend can be fermented and extruded to produce food of enhanced nutritional value.

Index Terms- Fermentation, Extrusion, Microorganism, Blend.

I. INTRODUCTION

Ingestion and assimilation of food substance by an organism provide energy, maintain life, or stimulate their growth (FAOSTAT, 2008). Food crops have occupied an important place in human nutrition as they remain the major source of calories and proteins for a large proportion of the world population particularly in the developing countries. The development of nutritionally balanced protein foods to feed the growing population in the world is receiving increasing attention (Edema *et al.*, 2005). Amongst the legumes widely cultivated in

Nigeria, groundnut is among the underutilized. It is a rich source of protein, carbohydrate and phosphorus and it is grown mainly for its oil protein, plant residue and seed cake (Asibuo *et al.*, 2008).

Defatted groundnut flour is listed as being very nutritional and is very low in saturated fat and cholesterol. It is also a good source of dietary fibre, thiamine, folate, potassium and zinc and a very good source of protein, niacin, magnesium, phosphorus, copper and manganese. Groundnut flour produced from cake blends easily enhances or enriches the nutritive value of wheat and other flour (Purohit and Rajyalakshme, 2011).

The demand for plantain fruit within the country is high, with supply struggling to meet demand. This has hampered the status of this crop as a foreign exchange earner. It remains an important staple food, source of revenue, as well as the raw material for industries producing value added products in many parts of Nigeria (FAO, 2006). Plantain occupies a strategic role in rapid food production, being a perennial ratoon crop with a short gestation period (Ayoola, 2011). Food processing is the transformation of raw ingredients, by physical or chemical means into food, or food into other forms. Food processing combines food ingredients to produce marketable food products that can be easily prepared and served by the consumer (Levenstein, 2003).

Food processing dates back to the prehistoric ages when crude processing incorporated fermenting, sun drying, preserving with salts, and various types of cooking (such as roasting, smoking, steaming and oven baking), such basic food processing involves enzymatic changes to the basic structures of food in its natural form, as well serve to build a barrier against surface microbial activity that cause rapid decay (Levenstein, 2003).

Fermentation is one of the oldest methods of food preservation, and embedded in traditional cultures and village life. Fermentation enhances the nutrient of food through biosynthesis and bioavailability of vitamins (Ijarotimi, 2012). Fermented foods are described as palatable and wholesome and are generally appreciated for attributes, their pleasant flavours, aromas, textures, and improved cooking and processing properties (Holzapfel, 2002).

Extrusion cooking technology has been described as a process in which raw materials are heated and worked upon mechanically while passing through compression screws and is forced through a die (Anuonye, 2012). Extrusion cooking has been used as an important technique for modification and manufacture of a wide variety of traditional and novel foods and

food blends (Jisha *et al.*, 2010). Blended foods are usually precooked by extrusion so that less cooking time is required and to increase shelf life.

II. MATERIALS AND METHODS

1 Collection of Raw Materials

Ripe plantain and groundnut sample were obtained from Oja Oba market in Akure, Ondo State, Nigeria. The samples were kept in a sterile transparent polythene bag and then transported to microbiology laboratory FUTA, for further analysis.

2 Processing of Ripe Plantain Flour

Ripe plantain was sorted for maturity and washed with water. The healthy ripe plantain were peeled and sliced thinly into 3mm diameter and oven dried at 40°C for 72hours. The dried ripe plantain was then fed into an attrition mill. The milled flour was sieved with a mesh sieve into fine flour and kept in an airtight container before use.

3 Processing of Groundnut Flour

Groundnut seeds were cleaned by sorting out dirt and stones. The cleaned groundnut seeds were coarsely milled to separate the coat from the cotyledon. The husk was separated from the seed by blowing air into it. The dehauled groundnut seeds were milled to give a paste after which the oil was removed to give a fine flour using an attrition mill after which it was sieved through a mesh. The groundnut flour was kept in an airtight container before use.

4 Formation of Groundnut-Plantain flour

The unripe plantain and groundnut flours were formulated in the ratio of (ripe plantain: groundnut) 100:0; 80:20; 60:40; 50:50 and 0:100 Sample A (100:0) = 100% ripe plantain flour Sample B (80:20) = 80% ripe plantain flour and 20% groundnut flour, Sample C (60:40) = 60% ripe plantain flour and 40% groundnut flour, Sample D (50:50) = 50% ripe plantain flour and 50% groundnut flour and Sample E (0:100) =100% groundnut flour.

5 Fermentation of Ripe Plantain and Groundnut Blends

A batch of the flour blends were fermented using submerged state fermentation method for 96 hours. The fermentation process was terminated by oven drying at 60°C for 24 hours.

6 Extrusion of the Samples

The extrusion process was carried out in a Brabender 20DN single screw laboratory extruder (Brabender OHG, Duisburg, Germany) having a uniform tapered screw with a nominal compression ratio of 2:1, diameter 19mm, length to diameter 20:1, die diameter 3mm and screw speed at feed inlet which was kept constant at 30rpm. Electrical heating was applied to the three barrel zones along the screw. The screw speed was maintained at 200rpm.

Two batches of samples were subjected to extrusion cooking. The first batch consists of the unfermented blends while the second batch was the fermented blends. The blends were hydrated and preconditioned by adding 10ml of water to 100g of the sample and manually mixed in a sterile bowl to ensure even distribution of water and form a dough. The dough were extruded using a Brabender 20DN single screw laboratory extruder

(Brabender OHG, Duisburg, Germany). All the extrudates were air dried for 12hours after which they were stored at 38±2°C in sterile polyethylene bags and kept in properly labelled air tight containers

7 Microbiological Analysis

Microbiological analyses were carried out on all the samples including the raw flour blends, during fermentation, on the extrudate as well as during storage. Samples were collected at 24hour interval during fermentation of the flour blends in triplicates. Serial dilution of the samples was carried out in testtubes by aseptically dissolving 1g of each sample (Plantain and groundnut) of five different concentrations at ratios (100: 0, 80:20, 60:40, 50:50 and 0:100) into 9ml of sterile distilled water and serially diluted into 10⁻⁵ dilution factor. 1ml of aliquot of dilution factor 10⁻³ and 10⁻⁵ of each sample was aseptically dispensed into different sterile Petri dishes containing Nutrient agar (NA), DeMan Rogosa and Sharpe agar (MRS) and potato dextrose agar (PDA), allowed to solidify and incubated at 37°C for 24 hours for bacterial growth and 28°C for 3 to 5 days for fungal growth.

8 Determination of pH

One gram of each sample (A-100% of Ripe Plantain; B- 80% Ripe Plantain and 20% Groundnut, C- 60%Ripe Plantain and 40%; D- 50% Ripe Plantain 50% Groundnut and E- 100% Groundnut) was dispensed into beaker containing 10ml of sterile distilled water then pH of the sample was taken using a glass electrode pH-meter (Hanna- pH 210) (Ojokoh *et al.*, 2014).

9 Determination of Temperature

Determination of temperature was done using a thermometer. The thermometer was inserted into the substrate every 24 hour to monitor the temperature (Ojokoh *et al.*, 2014).

10 Determination of Total Titrable Acidity (Tta)

Determination of total titratable acidity (TTA): The total titratable acidity of the fermenting extrudates was determined every twenty-four hour as described by AOAC (2012). Two (2) grams of the sample was weighed, 20ml of distilled water was added and then filtered. 10ml of the filtrate was measured and few drops of phenolphthalein indicator added. This was titrated with 0.1m sodium hydroxide (NAOH) solution and the titre values in milliliter were added from the burette (Ojokoh *et al.*, 2014). The acidity was calculated as follows:

$$TTA = \text{Titre Value} \times \text{Volume of Sample} \times 9\text{mg}/100.$$

11 Proximate Analysis

The proximate composition (moisture, ash, crude fibre, fat, protein and carbohydrate) of the fermented blends, fermented extruded blend, unfermented extruded blends and raw flour blends was determined according to the method of AOAC (2012).

12 Statistical Analysis

Data are represented as mean standard error ± SD. Significance of difference between different treatment groups was tested using one-way analysis of variance (ANOVA)using Duncan's new Multiple Range test at (P<0.05) Confidence Level using SPSS version 20.

III. RESULTS

1 MICROBIAL GROWTH DURING FERMENTATION OF RIPE PLANTAIN AND GROUNDNUT FLOUR BLENDS

1.1 Changes in Bacteria Population during Fermentation of Plantain and defatted Groundnut Blend.

Figure 1 shows the changes in the bacteria population of plantain and defatted groundnut. The bacteria population of the entire blend increased with increase in fermentation time. For sample A (Plantain 100%) at 24 hours, 48 hours and 72 hours the bacteria population increased with values 6.33cfu/g, 13.3cfu/g and 16.6cfu/g while at 96 hours of the fermentation it decreased to 11.0cfu/g. There was increase in bacteria population for sample B (Plantain 80%, Groundnut 20%) at 24 hours and 48 hours with values 10.0cfu/g and 12.6cfu/g, a sharp decrease was recorded at 72 hours with a value of 9.00cfu/g and increased to 16.6cfu/g at 96 hours. An increase in bacteria population for sample C was recorded throughout the fermentation period (24, 48, 72 and 96) with values 7.33cfu/g, 10.0cfu/g, 10.6cfu/g and 14.6cfu/g. There was increase in the bacteria population for sample D (Plantain 50%, Groundnut 50%) at 24 hours and 48 hours with values 8.33cfu/g and 8.00cfu/g. Decrease was recorded at 72 hours with a value of 3.00cfu/g while increase was observed at 96 hours with value 9.00cfu/g. Increase in bacteria population for sample E

was recorded throughout the fermentation period (24, 48, 72 and 96) with values 12.6cfu/g, 16.3cfu/g, 17.3cfu/g and 19.3cfu/g. The highest aerobic bacteria count was observed in flour blend E at 96 hours while the lowest count was observed in the flour blend A at 24 hours.

1.2 Changes in Fungi Population during Fermentation of Ripe Plantain and defatted Groundnut Blend.

Figure 2 shows the changes in the fungal population of the flour blends during fermentation. There was no fungal growth at 0 hour for all the samples. Sample A had an initial fungal count of 8.66 ± 0.67 CFU/g at 24 hours, decreased to 6.67 ± 0.67 at 48 hours, 5.33 ± 0.33 CFU/g at 72 hours and 4.67 ± 0.67 CFU/g at 96 hours. Sample B had an initial growth of 9.33 ± 0.88 CFU/g at 24 hours, 9.33 ± 0.33 CFU/g at 48 hours, decreased to 6.33 ± 0.33 CFU/g at 72 hours and 3.66 ± 0.33 CFU/g at 96 hours. Sample C had an initial growth of 7.00 ± 0.58 CFU/g at 24 hours, decreased to 5.66 ± 0.67 CFU/g at 48 hours, 3.33 ± 0.33 CFU/g at 72 hours and 4.66 ± 0.67 CFU/g at 96 hours. Sample D had an initial growth of 1.66 ± 0.33 CFU/g at 24 hours, increased to 3.00 ± 0.58 CFU/g at 48 hours, decreased to 2.00 ± 0.00 at 72 hours and increased to 4.67 ± 0.67 CFU/g at 96 hours. Sample E had an initial growth of 6.00 ± 0.58 CFU/g at 24 hours, decreased to 4.67 ± 0.67 CFU/g at 48 hours, 2.33 ± 0.33 CFU/g at 72 hours and 3.00 ± 0.00 CFU/g at 96 hours.

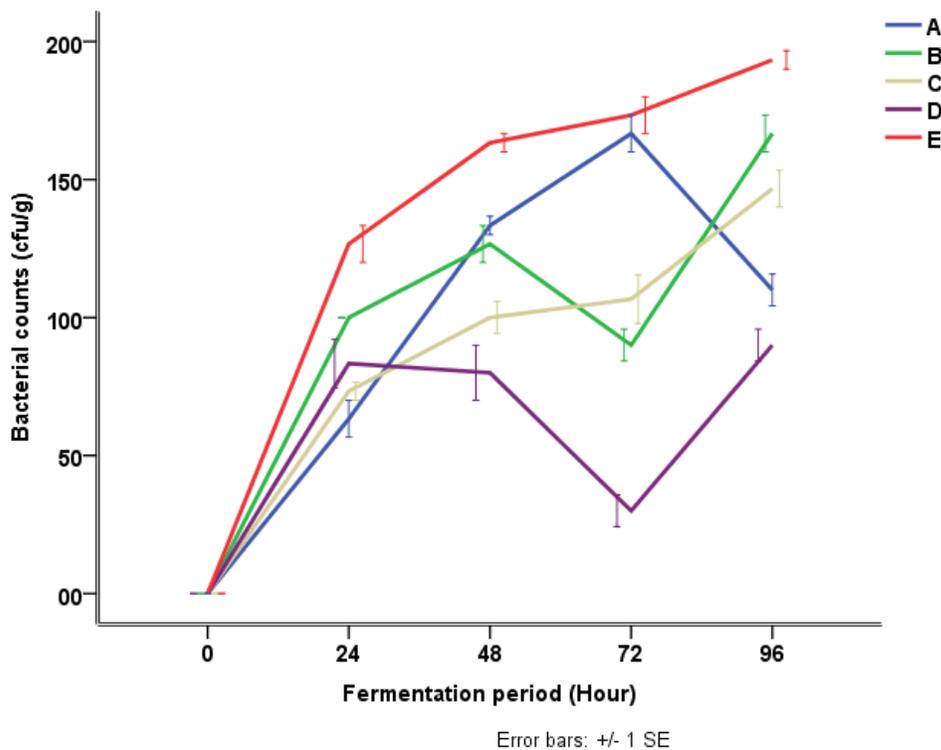


Figure 1: Changes in Bacteria Count during the Fermentation of Ripe Plantain and Groundnut blends ($\times 10^5$)

KEY: A= Plantain 100, B = Plantain 80%, Groundnut 20%, C= Plantain 60%, Groundnut 40%, D= Plantain 50%, Groundnut 50%, E=Groundnut 100%

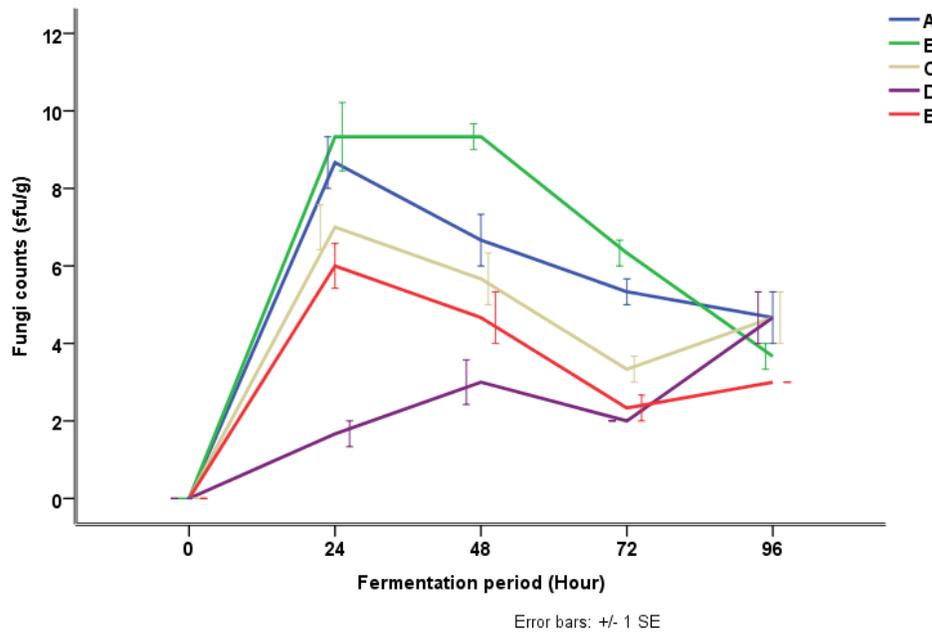


Figure 2: Changes in Fungi Count during the Fermentation of Ripe Plantain and Groundnut blends ($\times 10^5$)

KEY: A= Plantain 100, B = Plantain 80%, Groundnut 20%, C= Plantain 60%, Groundnut 40%, D= Plantain 50%, Groundnut 50%, E=Groundnut 100%.

1.3 Microorganisms isolated during the fermentation of ripe plantain and groundnut flour blends

A total of fourteen (14) microorganisms were isolated during the fermentation of ripe plantain and groundnut flour blends. These comprise of ten (10) bacteria three (3) moulds and one (1) yeast. These are *Bacillus subtilis*, *Bacillus cereus*, *Bacillus polymyxa*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Pseudomonas fluorescens*, *Lactobacillus fermentum*, *Aspergillus niger*, *Aspergillus flavus*, *Fusarium oxysporum*, *Lactobacillus plantarum* and *Saccharomyces cerevisiae*.

2 Changes in pH during Fermentation of Ripe Plantain and defatted Groundnut Flour Blend.

The pH variations during the fermentation of ripe plantain-groundnut extrudates are shown in Figure 3. Sample A gradually decreased from 5.20 ± 0.00 to 3.76 ± 0.03 , Sample B decreased from 5.30 ± 0.00 to 3.80 ± 0.00 . Sample C, decreased from 5.50 ± 0.00 to 3.80 ± 0.00 . Sample D decreased from 5.60 ± 0.00 to 3.90 ± 0.00 . Sample E at 0 h decreased from 6.00 ± 0.05 to 5.83 ± 0.03 at 24 hours and 48 hours increased to 6.50 ± 0.0 at 72 hours and finally increased to 6.90 ± 0.00 at 96 hours.

3 Changes in Temperature during Fermentation of Ripe Plantain and Groundnut Flour Blends.

Variation in temperature during the fermentation of Ripe Plantain and groundnut flour extrudates are represented in Figure

4. The temperature ranges from 33.0°C to 25.6°C at 0 hour. The temperature value ranges from 31.0°C to 31.0°C at 24 hours. The temperature value ranges from 29.6°C to 31.0°C at 48 hours. The temperature value ranges from 28.0°C to 27.0°C at 72 hours and the temperature range at 96 hours were from 25.6°C to 27.0°C .

4 Changes in Total Titratable Acidity during Fermentation of Ripe Plantain and groundnut

Variations in titratable acidity (TTA) during fermentation of ripe plantain-groundnut extrudates are represented in Figure 5. Sample A had TTA of 0.010 ± 0.00 at 0 hour; this increased to 0.015 ± 0.00 and 0.027 ± 0.00 at 48 hours and 72 hours and decreased slightly to 0.012 ± 0.00 at 96 hours. Sample B increased from 0.026 ± 0.00 at 0 hour and decreased slightly to 0.018 ± 0.00 at 24 hours, increased slightly to 0.024 ± 0.00 at 48 hours and then decreased to 0.009 ± 0.00 at 72 hours and finally increased to 0.033 ± 0.00 at 96 hours. Sample C at 0 hour decreased from 0.030 ± 0.00 to 0.018 ± 0.00 at 24 hours and slightly increased to 0.027 ± 0.00 at 48 hours, decreased to 0.012 ± 0.00 at 72 hours and finally increased to 0.033 ± 0.00 at 96 hours. Sample D at 0 hour decreased from 0.020 ± 0.00 to 0.018 ± 0.00 at 24 hours at 48 hours decreased from 0.030 ± 0.00 to 0.015 ± 0.00 at 72 hours and finally increased to 0.042 ± 0.00 at 96 hours. Sample E (Groundnut 100%) at 0 hour decreased from 0.033 ± 0.00 to 0.027 ± 0.00 at 24 hours and 48 hours, decreased to 0.015 ± 0.00 at 72 hours and finally increased to 0.042 ± 0.00 at 96 hours.

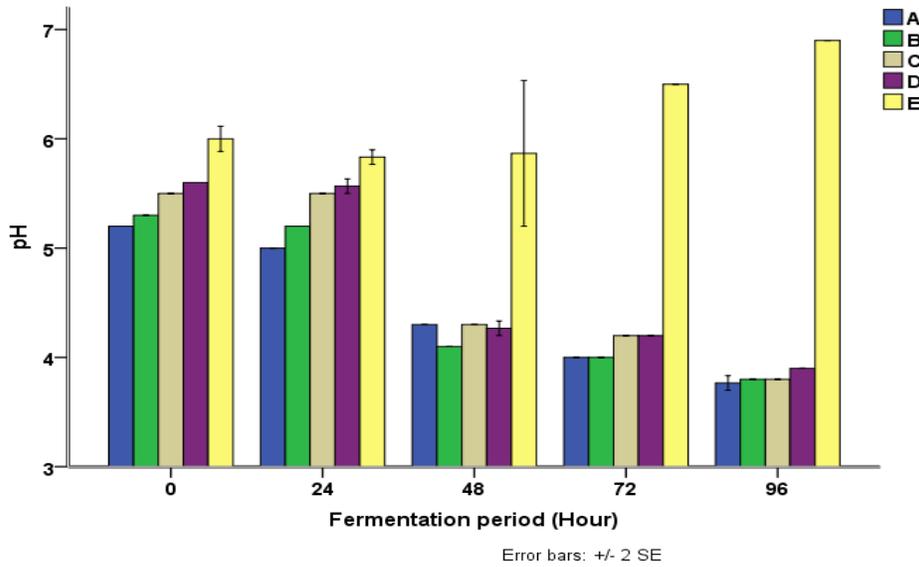


Figure 3: pH Value during Fermentation of Ripe Plantain and Defatted Groundnut Blend.

KEY:

A= Plantain 100%, B= Plantain 80%, Groundnut 20%, C= Plantain 60%, Groundnut 40%, D= Plantain 50%, Groundnut 50%, E=Groundnut100%

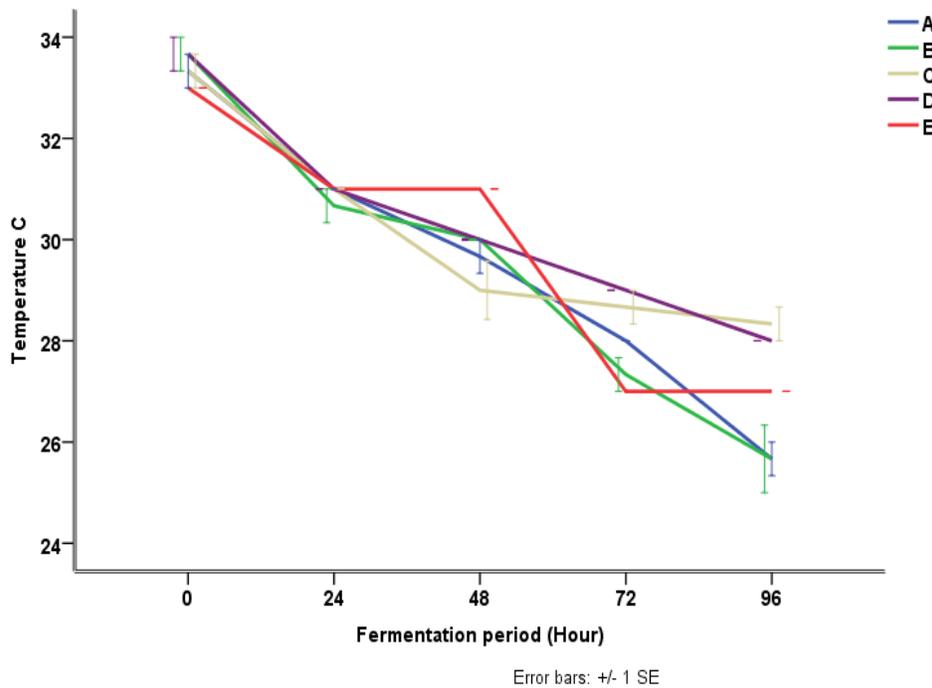


Figure 4: Temperature (°C) during Fermentation of Ripe Plantain and defatted Groundnut flour Blends.

KEY:

A= Plantain 100%, B= Plantain 80%, Groundnut 20%, C= Plantain 60%, Groundnut 40%, D= Plantain 50%, Groundnut 50%, E= Groundnut 100%

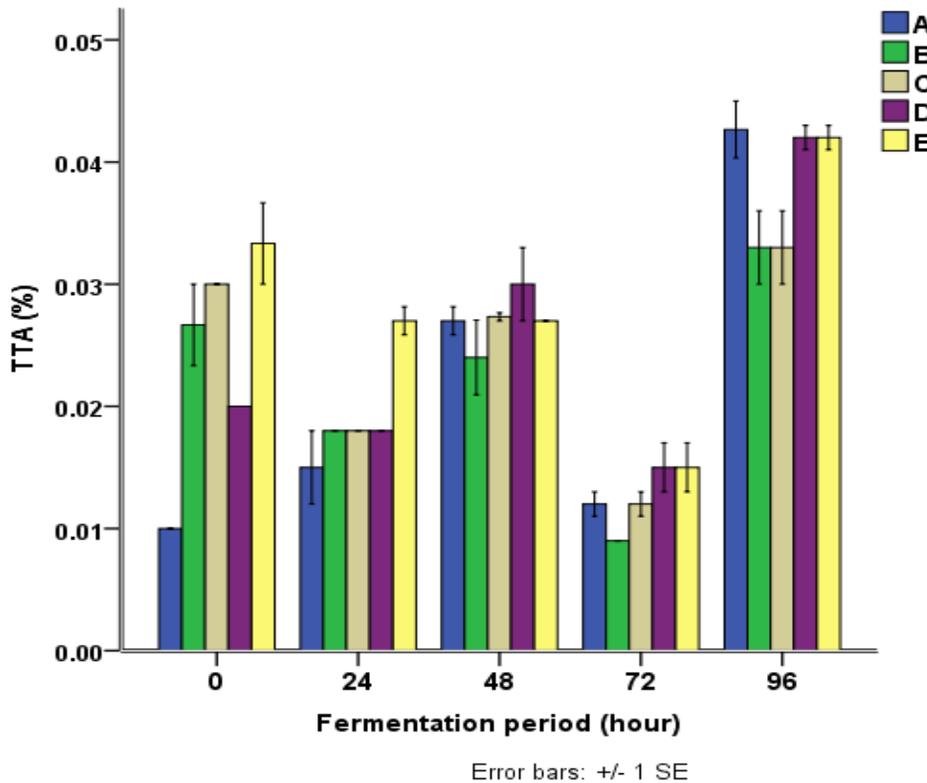


Figure 5: Total Titratable Acidity Variation during the fermentation of Groundnut and Ripe Plantain Blend

KEY: A= Plantain 100g, B= Plantain 80g, Groundnut 20g, C= Plantain 60g, Groundnut 40g. D= Plantain 50g, Groundnut 50g E= Groundnut 100g

5 Changes in Proximate Composition of Ripe Plantain and Groundnut Flour Blend.

5.1 The ash content of ripe plantain-groundnut flour blend

The changes in the ash content of the ripe plantain-groundnut blends are represented in Table 1. The ash content of the raw blends range from 3.03 ± 0.00 to 3.38 ± 0.05 . There was no significant difference between samples B and C. Fermented samples had values ranging from 1.35 ± 0.01 to 1.55 ± 0.01 . Extruded unfermented samples had values ranging from 2.52 ± 0.01 to 3.56 ± 0.01 . Extruded fermented blends had ash content ranging from 1.39 ± 0.04 to 1.77 ± 0.00 .

5.2 The moisture content of ripe plantain-groundnut blend

The moisture content of ripe plantain-groundnut flour blends are represented in Table 1. Raw flour blend had the lowest moisture content with values ranging from 2.19 ± 0.01 to 6.08 ± 0.00 . There was no significant difference ($p \leq 0.05$) in raw flour A and B. Fermented blend had the highest moisture content with fermented blend ranging from 26.0 ± 0.01 to 32.6 ± 0.05 in samples A-E. The extruded unfermented blends ranged from 2.76 ± 0.02 to 5.24 ± 0.03 in samples A-E. Extruded fermented sample exhibited moisture content ranging from 9.80 ± 0.00 to 15.9 ± 0.00 .

5.3 The fat content of ripe plantain-groundnut flour blends

The fat content of ripe plantain groundnut blends are shown in Table 1. There was significant ($p \leq 0.05$) difference in the fat content of the raw flour blends A to E with values ranging from 0.40 ± 0.00 to 28.4 ± 0.11 . There were significant ($p \leq 0.05$) changes in the fermented blends A to E with values 1.00 ± 0.01 to 15.0 ± 0.05 . The extruded unfermented (EU) had the highest fat content with values ranging from 1.36 ± 0.00 to 21.8 ± 0.05 . Fat content of extruded fermented samples ranged from 1.36 ± 0.00 to 18.2 ± 0.11 .

5.4 The crude fibre content of ripe plantain-groundnut flour blends

The crude fibre content of the ripe plantain-groundnut blends are shown in Table 1. There was significant difference ($p \leq 0.05$) in the crude fibre content of the blends. The crude fibre of the raw blends range from 0.66 ± 0.01 to 8.15 ± 0.02 . Fermented blends had the highest crude fibre content ranging from 9.65 ± 0.04 to 17.5 ± 0.02 . Extruded unfermented blends had crude fibre content ranging from 0.73 ± 0.06 to 9.26 ± 0.00 . Extruded fermented blends ranged from 5.09 ± 0.00 to 15.0 ± 0.01 .

5.5 The protein content of ripe plantain-groundnut flour blends

The variations in protein content of ripe plantain-groundnut blends are shown in Table 1. There was significant ($p \leq 0.05$) difference in the raw flour blends with values ranging from 2.45 ± 0.00 to 8.06 ± 0.00 . Fermented samples recorded significant difference ($p \leq 0.05$) for all the blends with values ranging from 2.49 ± 0.00 to 9.77 ± 0.00 . The extruded unfermented sample has protein content ranged from 6.33 ± 0.00 to 16.6 ± 0.05 . Extruded fermented samples exhibited significant difference ($p \leq 0.05$) among all the blends with values ranging from 4.97 ± 0.00 to 9.77 ± 0.01 .

5.6 The carbohydrate content of ripe plantain-groundnut flour blends

The carbohydrate content of ripe plantain-defatted groundnut blends is shown in Table 1. Carbohydrate content of raw flour blends ranged from 58.4 ± 0.00 to 75.7 ± 0.01 . The fermented blends had carbohydrate content ranging from 35.6 ± 0.01 to 62.9 ± 0.03 . Extruded unfermented blends had carbohydrate content ranging from 45.7 ± 0.01 to 80.3 ± 0.00 . The extruded fermented blends had values ranging from 10.2 ± 0.05 to 80.8 ± 0.05 .

Table 1: Proximate composition Ripe Plantain and Groundnut flour blend.

Samples	Ash (%)	Moisture (%)	Fat (%)	Crude (%)	Protein (%)	Carbohydrate (%)
RA	3.03 ± 0.00^j	6.08 ± 0.00^g	0.40 ± 0.00^a	2.06 ± 0.02^b	2.45 ± 0.00^a	75.7 ± 0.01^e
RB	3.38 ± 0.05^l	2.19 ± 0.01^a	4.13 ± 0.00^b	7.13 ± 0.01^c	6.07 ± 0.19^b	75.2 ± 0.07^c
RC	3.33 ± 0.00^l	4.17 ± 0.01^d	14.8 ± 0.11^c	8.15 ± 0.02^j	6.78 ± 0.00^c	64.8 ± 0.00^b
RD	3.04 ± 0.01^j	3.37 ± 0.01^c	22.4 ± 0.11^d	0.66 ± 0.01^f	6.07 ± 0.00^b	58.4 ± 0.11^a
RE	3.13 ± 0.04^k	2.61 ± 0.00^b	28.4 ± 0.11^e	5.91 ± 0.06^d	8.06 ± 0.00^e	58.4 ± 0.00^a
FA	1.35 ± 0.01^{bc}	26.2 ± 0.06^{lm}	1.00 ± 0.00^a	9.65 ± 0.04^j	2.49 ± 0.00^a	62.9 ± 0.05^e
FB	1.38 ± 0.00^{bcd}	28.2 ± 0.01^n	8.85 ± 0.00^b	17.5 ± 0.02^q	7.46 ± 0.00^d	39.6 ± 0.05^c
FC	1.55 ± 0.01^e	26.5 ± 0.04^{mn}	9.10 ± 0.00^c	11.9 ± 0.00^o	4.96 ± 0.00^b	55.8 ± 0.01^d
FD	1.31 ± 0.01^b	26.0 ± 0.01^l	14.1 ± 0.05^d	15.6 ± 0.05^n	7.22 ± 0.00^c	35.6 ± 0.01^a
FE	1.21 ± 0.05^o	32.6 ± 0.05^j	15.0 ± 0.05^e	10.4 ± 0.00^i	9.77 ± 0.00^e	38.1 ± 0.01^b
EUA	3.45 ± 0.01^m	5.24 ± 0.03^f	1.36 ± 0.00^a	0.73 ± 0.06^a	9.88 ± 0.01^c	80.3 ± 0.00^e
EUB	2.52 ± 0.01^h	4.73 ± 0.01^e	3.36 ± 0.00^b	6.33 ± 0.00^a	6.33 ± 0.00^a	74.3 ± 0.05^d
EUC	2.92 ± 0.06^i	4.35 ± 0.01^c	5.51 ± 0.00^c	9.26 ± 0.00^e	8.67 ± 0.00^b	68.0 ± 0.57^c
EUD	3.56 ± 0.01^n	4.35 ± 0.02^d	19.3 ± 0.05^d	8.58 ± 0.00^h	14.0 ± 0.07^d	51.4 ± 0.01^b
EUE	2.49 ± 0.00^h	2.76 ± 0.02^h	21.8 ± 0.05^e	7.25 ± 0.32^g	16.6 ± 0.05^e	45.7 ± 0.01^a
EFA	1.68 ± 0.00^f	9.80 ± 0.00^h	1.36 ± 0.00^a	6.92 ± 0.03^i	6.66 ± 0.00^c	80.8 ± 0.05^e
EFB	1.77 ± 0.00^g	10.7 ± 0.12^i	3.05 ± 0.00^b	5.09 ± 0.00^p	6.55 ± 0.01^b	77.0 ± 0.05^d
EFC	1.52 ± 0.04^e	11.0 ± 0.57^i	3.36 ± 0.14^c	10.2 ± 0.04^l	8.36 ± 0.00^d	70.5 ± 0.00^c
efd	1.39 ± 0.04^{cd}	15.9 ± 0.00^k	12.6 ± 0.05^d	15.0 ± 0.01^m	4.97 ± 0.00^a	35.6 ± 0.05^b
efe	1.43 ± 0.02^d	12.6 ± 0.03^j	18.2 ± 0.11^e	8.99 ± 0.00^n	9.77 ± 0.01^e	10.2 ± 0.05^a

Values are means of triplicate determinations \pm SD. Means in the same column with different superscripts are significantly different ($p \leq 0.05$)

KEY: RA= Plantain 100g, RB= Plantain 80g Groundnut 20g, RC= Plantain 60g Groundnut 40g, RD= Plantain 50g Groundnut 50g, RE= Groundnut 100g, FA= Fermented Plantain 100g, FB= Fermented Plantain 80g Groundnut 20g, FC= Fermented Plantain 60g Groundnut 40g, FD= Fermented Plantain 50g Groundnut 50g, FE= Fermented Groundnut 100%. EUA=Extruded Unfermented Plantain 100g, EUB=Extruded Unfermented Plantain 80g Groundnut 20g, EUC=Extruded Unfermented Plantain 60g Groundnut 40g, EUD= Extruded Unfermented Plantain 50g Groundnut 50g, EUE= Extruded unfermented Groundnut 100g, EFA-Extruded Fermented Plantain 100g, EFB-Extruded Fermented Plantain 80g Groundnut 20g, EFC-Extruded Fermented Plantain 60g Groundnut 40g, EFD-Extruded Fermented Plantain 50g Groundnut 50g EFE- Extruded Fermented 100g.

IV. DISCUSSION

Different types of microorganisms were isolated during the fermentation of ripe plantain and defatted Groundnut. Fourteen microorganisms were isolated which include (eight bacteria, three moulds and one yeasts). The microorganisms were *Bacillus cereus*, *Bacillus subtilis*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Lactobacillus fermentum*, *Proteus mirabilis*, *Bacillus polymyxa*, *Lactobacillus plantarum*, *Pseudomonas aeruginosa*, *Pseudomonas fluorescens*, *Aspergillus flavus*,

Aspergillus niger, *Fusarium oxysporium* and *Saccharomyces cerevisiae*. The microbiological changes observed during the fermentation was as a result of increase in total bacteria count. The result showed that diverse group of microorganisms were present during the fermentation process (Ojokoh and Olatubi 2015).

The presence of organisms like *Staphylococcus* sp., *Pseudomonas* sp., and *Proteus* spp. could have been as a result of contamination during handling and processing. Some of these bacteria are dangerous as can produce toxic metabolite which can affect the consumer. *Aspergillus* spp. and *Bacillus* are known to

be associated with grains. The eventual disappearance of other microorganisms may not be unconnected with the increase in the acidity of the medium as a result of the fermentative activity of the lactobacillus Daramola and Agbi (2014).

The decrease in pH may be as a result of the activities of microorganisms on the fermentable substrate which led to the hydrolysis of complex organic compounds of the substrate thereby producing acid and ethanol. This is similar to the findings of Ojokoh and daramola, (2012). The acids produced led to decrease in pH and increase in total titratable acidity which consequently resulted in decreasing microbial load. The pH of each blend decreased with increase in fermentation time. This is similar to a result reported by Ojokoh and Udeh (2014).

During the process of fermentation, the temperature of each batch was observed to decrease as fermentation time progresses. The fluctuation in temperature may be due to the presence of different microorganisms during fermentation process. This supports the fact that fermentation is an exothermic process and that the heat generated was due to metabolic activities of the microorganisms such as the Bacillus species converting ethanol previously produced by yeast to acetic acid thereby releasing heat.

Total Titratable Acidity (TTA) of the fermented ripe plantain and groundnut increased, this is similar to a report by Ojokoh (2014). However, the result of this fermentation research suggests that it is a lactic type where pH of fermenting media decreases with increase in total titratable acidity (TTA).

Moisture content of all the samples was significantly different from each other. The moisture content of the fermented flour blends was significantly higher than the raw flour, fermented extruded and extruded unfermented samples. This could be due to the absorption of water during fermentation process (Onasanya and Akinbile, 2015). Low moisture content of food sample gives product a long shelf life since microbial activity is reduced and increased storage periods of the food product reported by Aremu *et al.*, (2006) and Alozie *et al.*, (2009) while high moisture content in food encourages microbial growth.

The ash content is an inorganic residue remaining after the removal of the water and organic matter which provides a measure of total amount of minerals in the food component. Fermentation caused a significant reduction in the ash content of the samples, this corresponds with the report of Omafuvbe *et al.* (2004). The lower ash content recorded in the extruded fermented (EF) samples as compared with that of raw flour blends (RF) and extruded unfermented (EU) could be as a result of the retting of the extrudates there by encouraging the leaching of water soluble mineral content of the extrudates during the fermentation process and this loss of minerals could have served as the mineral source for the fermenting microorganisms (Abu, 2005). The low ash content in fortified meals does satisfy the recommended minimum composition in accordance to Agunbiade and Ojezele (2010) report.

Fat content are one of the major components of food that provides energy and essential lipids. Fat content was highest in raw flour blends. Reduction in the fat content of extruded unfermented and extruded fermented blends could be due to lipid oxidation. Lipid oxidation can reduce the nutritive quality of food by decreasing the content of essential fatty acids, such as

linoleic and linolenic acid, which are essential fatty acids. These long chained fatty acids are highly susceptible to oxidation which results from application of temperature during extrusion. (Ranjit and Subha, 2014).

The result from this study confirmed the observation that groundnut is rich in protein content. As the groundnut proportions were increased the protein content of the sample increased significantly ($p > 0.05$). The decrease in protein content in some of the unfermented extrudates compared with the fermented extrudates could as well be attributed to interaction of amino acid in maillard reactions. The increase in protein content is probably due to increase in microbial cell mass during fermentation. Increase in protein content of food resulting from increase in microbial cell mass has been reported by other investigators during fermentation of various foods including jack beans (Onyango, et al., 2004) and soya products (Ojokoh and Wei, 2011). Another reason for increase in protein content may be due to the structural proteins that are integral part of the microbial cells (Tortora *et al.*, 2002).

Crude fibre gives bulk to food and aids in regulating physiological functions in the body. Fibre is an indigestible component of food material that helps in improving roughage and bulk as well as contributes to a healthy condition of the intestine (Potter and Hotchkiss, 2004). The values of crude fibre in unfermented extrudates was low compared to the raw blends. Fermentation caused reduction in the crude fibre content of the extruded fermented samples. The reduction in fibre could be as a result of the activities of microorganisms involved in the fermentation process, secretion of cellulose enzymes which aid in the breakdown of the crude fibre (Olatubi and Ojokoh, 2015).

The carbohydrate content of the raw blends decreased with increase in groundnut. Abiodun and Ogugua (2012) also reported decrease in the carbohydrate content of raw blends of acha and cowpea flour. Reduction in the carbohydrate content of fermented unextruded blends could be as a result of utilization of carbohydrate by microorganisms during fermentation. Decrease in carbohydrate content of fermented samples may be because it was used up as the main source of energy during fermentation. This may be because fermentation improved carbohydrate content of the blend (Anuonye *et al.*, 2009).

V. CONCLUSION

This study has revealed that groundnut and plantain blend can be fermented to produce food of enhanced and better nutritional value with low anti-nutrient content. The processing techniques employed in this research offer the possibility of better storage stability of food, added value and creation of new markets in the food industries.

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AUTHORS

First Author – OJOKOH A. O, Department of Microbiology, Federal University of Technology, P.M.B. 704, Akure, Ondo State, Nigeria.
Second Author – AJAYI-CHOCO T. L, Department of Microbiology, Federal University of Technology, P.M.B. 704, Akure, Ondo State, Nigeria.

Corresponding author: Ajayi-Choco T. L.
Email: ajayichocotemidayo@yahoo.com

Classroom to Workplace: Communication Tools and Technology

Dr. Chynette Nealy

*Department of General Business, Marketing & Supply Chain Management, University of Houston Downtown

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Abstract- This article discusses how collaborations between business faculty and industry representatives focusing on redesigning business communication content and assignments offer fresh approaches to using communication tools and technologies. The objective of this pilot study was to identify where gaps exist in the expected technology skills of business majors as identified by industry representatives. The results offer insight into stakeholders' perceptions and pedagogical applications.

Index Terms- business communication, business faculty and industry collaboration, pedagogy, workplace technology

I. INTRODUCTION

Emerging communication tools and technologies provide opportunities for developing course content that equips business majors with industry expected skills. The Association to Advance Collegiate Schools of Business (AACSB International), an accreditation organization for business programs recommends that business programs use effective pedagogies inclusive of active learning and *technology* [1]. A major challenge to this recommendation is how to best incorporate emerging educational technology such as a Learning Management System (LMS), into course content and activities. LMS is commonly defined as a software that allows the management and delivery of learning content and resources. Some examples include Blackboard, Moodle, Canvas [2], [3].

A noticeable theme in related literature about the mentioned challenge above suggests there is limited consensus about LMSs among decision-makers at higher education institutions and learning technology companies. There are various issues such as current and future types of LMSs, features, functions and users' satisfaction [4], [2], [5], [3], [6], [7]. One key issue stems from the notion some LMSs have limited functions which might not support a variety of pedagogical approaches used within higher education institutions [8], [9], [5],[3].

To illustrate the issue, in this case business majors might not be able to experience a reality-based common industry practice of communicating with people around the world. Although business majors will likely experience culturally diverse academic settings, an opportunity to collaborate via communication technologies with a global industry team should develop intercultural communication practices [10], [11]. Industry depends on technology companies to facilitate a variety of global connections via communication technologies designed

to access internal and external links such as: web conferences, emails, social networking and videoconferences in order to manage daily operational processes. Most LMSs' have portal based systems with internal features which do not include options for external and/or global collaborations [4], [5], [3], [12].

Accordingly, literature and accreditation recommendations that focus on bridging the *gaps* between *theory* and *practice* suggest disconnects between how business programs prepare students and what industry expects [13],[14],[1],[15],[16],[17],[18],[19],[20],[21],[22], [23]. For example, the US Chamber of Commerce Foundation has highlighted the need for partnerships between employers and academic institutions, pointing to findings that suggest "While 96 percent of chief academic officers at higher-education institutions say they're effectively preparing students for work, only 11 percent of business leaders strongly agree, the polling company Gallup found. Thereby, concluding the education system is "failing to keep pace with the changing needs of the economy [24]."

In sum, employers posit that higher education is failing in its role to adequately develop needed skills in students. They point to a need for professors to influence students by promoting the skills businesses are seeking in future employees, e. g. communication, technical, collaboration, ethics and social responsibility, etc., and to help students achieve these skills through course activities [25], [26], [27], [28].

Reviews of additional literature identify significant challenges within academic settings, e.g. discipline-based pedagogical differences, changes in technology, disagreement on curricula and others. All of which detract from instructors' time to integrate feedback from industry about developing employment skills. Similarly, industry settings experience these challenges, although described from different perspectives ranging from global, domestic, demand side to supply side of the marketplace [29], [30], [31], [18],[20],[32],[33],[34]. In general, these challenges show there is a need to explore the perceptions of decision-makers at higher education institutions and learning technology companies on suitable resources for an academic setting which prepares business majors for the global workplace.

It is plausible to suggest these challenges might impede collaborations between academicians and practitioners in terms of addressing the needs and wants of both stakeholders. Taken together these findings might explain perceived academic *gaps* in developing business majors' knowledge and skills expected for employment. As a consequence, business majors are more likely

to have limited knowledge about what industry values, such as, the importance of possessing transferable skills [35],[36], [37], [38], [39], [40]. For example, given technology's profound impact on skills that employers want from business graduates, prior to graduating, business majors should be able to demonstrate an awareness of paradigm shifts brought about by continuous technological changes [41], [42], [1], [43].

Hence, a reasonable strategic plan should be to adopt an LMS which facilitates via features and functions options that allow adjustments to course content and applications consistent with technological changes. For instance, this might consist of non-technical topics which equip students with skills for communicating across cultures, generations, and other group characteristics inclusive of *apps (software applications), i.e. computer programs designed to complete specific functions*. In doing so, business majors should be able to contextualize applicable knowledge and apply transferable skills when entering the workplace. Thus, the strategic plan must embrace collaborations between academicians and practitioners to lessen perceived *gaps* in preparedness and employability skills. The following describes a pilot study designed to identify where *gaps* exist in the expected technology skills of business majors as identified by industry representatives.

II. RESEARCH ELABORATIONS

Within the context of bridging the gap between *theory* and *practice*, the author, a business professor, audited a core course, Business Communication, to identify usable data which might accommodate adjusting the course and/or specific applications related to emerging communication tools and technologies to address industry expectations. The business communication course serves as a required skill based core course for undergraduate business majors across disciplines (e.g. accounting, finance, general business, insurance and risk management, international business, management, management information systems, marketing, and supply chain management). After the audit, invitations were sent to twenty-five industry representatives from various organizations to participate in a round-table discussion about expected knowledge and skills related to communication tools and technologies. All twenty-five industry representatives, each matching majors offered by the college, agreed to participate in the discussion. The discussion was guided by data from the audited which focused on topics and assignments related to paradigm shifts brought about by continuous technological changes.

We discussed the use of LMSs in higher education and challenges associated with support instructional strategies and student learning. Threaded in the discussions was literature related to users; satisfaction which included limited features and functions of LMSs. Selected examples of modules (topics and assignments) customized in an LMS were used to show how students are introduced to discipline-based communication technologies. These modules are designed to help students develop knowledge and skills applicable to a variety of workplace settings. The presentation showed some of the LMS's limitations with respect to external features and functions. This method allowed industry representatives to view the matter from an academic perspective to determine *gaps* in preparedness and

employability skills. Options were presented that encouraged the need for external industry collaborations to develop course contents inclusive of practicing communication technologies via a reality-based specific workplace setting specific to their discipline (majors).

A key outcome from the discussion was an invitation for business majors to visit the various organizations represented. This pilot agreement allowed industry representatives to showcase via their organizational settings workplace technologies in terms of expected performance applicable to each major. To accommodate this invitation, the author selected a business communication course given its diverse pool of business majors, created discipline-based teams and planned a flipped course design, i.e. "that which is traditionally done in class is now done at home, and that which is traditionally done as homework is now done in class [44]." This course design encourages student to prepare before coming to class in order to facilitate a variety of high impact in-class activities. With this in mind and the pilot study's objective, *to identify where gaps exist in the expected technology skills of business majors as identified by industry representatives*; the author developed and administered a pre-class survey using the survey tool Qualtrics. Students enrolled in the selected course were instructed to complete the survey before class and before reading related course material about the topic.

III. RESULTS

Results from the survey supported industry concerns about business majors' preparedness in terms of technological readiness for the workplace. Although the sample size (n=40) was small only (3) participants indicated (very satisfied) when asked *about perceived satisfaction with knowledge and skills related to discipline-based communication tools and technologies*. These findings were discussed in-class to highlight the importance of learning first-hand what kind of communication tools and technology are expected for applicable employment prospects. To illustrate the key findings from the survey, a pre-class reading assignment, [35], about college students' perceptions of preparedness for careers was used to engage and challenge participants. This set the course for a range of individual and team/work activities. Examples include: evaluating the primary needs of employers to improve employment prospects, conducting research to identify perceived gaps between business majors and industry representatives about expected technology skills, evaluating data sources for business research, drafting/revising legal and ethical messages using communication technology, preparing to present effectively in teams.

The flipped class design and activities allowed participants to prepare and meet with industry representatives for discussions about expected industry standards related to communication tools and technologies. Participants representing eight teams: general business, international business, management, management information systems, marketing, supply chain management and accounting (two teams); reported gaining "reality-based knowledge and practice" from the industry visits. In turn, teams prepared written reports and presentations to demonstrate their *understanding of paradigm shifts brought about by continuous*

technological changes. Activity takeaways were: participants invited their host industry representative to attend the presentations, each team presented findings about primary *apps* used by their host industry representative and all teams shared and compiled a summary findings of communication tools and technologies utilized at the various workplaces. A brief description of selected examples follow.

Fishbowl Inventory designed for small to mid-sized companies looking for a complete inventory management system without replacing QuickBooks for Accounting. Many companies using a combination of QuickBooks and Excel have said they need a more robust solution but are not ready for an enterprise-level ERP system [45].

Square Up is an easy to use program for any type of business and increases accessibility between users from different generational backgrounds. It is mainly utilized as a portable payment processing system. Square Up can track inventory, send alerts to circumvent low stock, send electronic purchase receipts via email and generates real time analytical reports [46].

Salesforce is a cloud based tool that helps more than one-hundred thousand customers and two million subscribers worldwide to manage people and processes. An easy-to-use application, Salesforce streamlines all steps of the sales process, including lead management, analytics, and forecasting. This application is utilized in industries such as divisions including Financial Services, Manufacturing, Media, Healthcare, Higher Education, Retail, and Non-profit organizations [47].

IV. CONCLUSIONS

The collaborative approach during all phases of this study seemed to enhance engagement by all participants and at all levels. Participants, internal and external, followed instructions, completed agreed activities and met the pilot study's objective *to identify where gaps exist in the expected technology skills of business majors as identified by industry representatives*. It is important to be cognizant that this was a pilot study with a small sample size. However, these findings have a number of theoretical and practical implications, such as: using best practices from industry standards to revise business communication content and applications. As clearly articulated in an archived article retrieved from the accreditation organization AACSB, it appears that industry and academia are in agreement that business programs require dramatic changes to the curriculum that are aligned with the needs of the new global workforce. The case for making business programs more desirable has never been so critical. And, business schools need to quickly get on board with deep changes to their curriculums to avoid further declines [48]. Employers expect new graduates to contribute in meaningful and innovative ways once hired, thus, it seems reasonable for academic programs to make adjustments to accommodate that need [49]. In this case, as suggested technological change demands connections between education and employment. These changes will require continuous skill acquisition for professional relevance [50], [51].

Based on this, a reasonable best practice for academics to consider when assessing LMSs and related technologies might be to focus on options which best support collaborations with industry that accommodates development of twenty-first century

skills. The author of this articles recommends two key takeaways from a study, [52], about twenty-first century pedagogies which should help with accommodating and equipping students with competencies and skills.

Teachers must become comfortable with managing new forms of classroom dynamics and supporting multiple teams of students working independently, as they explore and gain new understandings and skills to prepare them for twenty-first century life [52], [53].

Real-world experiences merged with sustained engagement and collaboration offer opportunities for learners to construct and organize knowledge; engage in detailed research, enquiry, writing and analysis; and communicate effectively to audiences [52], [54].

The challenges related to changing communication tools and technology cited above suggest a need to address expected technology skills between academic and industry settings. Results from this pilot study contribute to pedagogies strategies in terms of options for developing and implementing "innovative" business programs, course content and applications. Business majors should be able to transfer meaning from their academic (*theory*) experiences into professional (*practical*) experiences required in the workplace. This article underscores the importance of selecting an LMS with options that facilitate reality-based experiences in order to provide business majors with experiences they might encounter in the workplace. Thus, this pilot study was a useful career development activity. Overall, it was mutually beneficial for all participants in providing insight about *bridging the gaps between academicians and industry perceptions*.

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nealyc@uhd.edu

Correspondence Author – Dr. Chynette Nealy
nealyc@uhd.edu
Telephone: 713-222-5367.

AUTHORS

First Author – Dr. Chynette Nealy, Professor of Business Administration, University of Houston Downtown

The Effectiveness of Student Worksheets Based on Project and Integrated Information Technology in Geometry Space Subject

Hafizah Delyana¹, Radhya Yusri^{1*}, Nurmi², Alfi Yunita¹

¹Mathematics Education Department, STKIP PGRI Sumatera Barat, Padang, West Sumatra, Indonesia

²Informatics Education Department, STKIP PGRI Sumatera Barat, Padang, West Sumatra, Indonesia

Corresponding author: radhyayusri01@gmail.com

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Abstract- Student learning outcomes in Space Geometry subject are still low in Mathematics Education Department STKIP PGRI Sumatera Barat. This caused the lecturers and students still use teaching materials in the form of old published textbooks whose language is not communicative so that it is difficult to understand. Lecturers have created student worksheets but the expected learning outcomes cannot motivate students to be active, creatively and independently involved in carrying out the learning process. Therefore, they have been developed student worksheet based on project and integrated information technology in the subject of Space Geometry. The aim of this study was to determine the effectiveness of student worksheets based on project and integrated information technology in the subject of Space Geometry. This type of research is a quasi-experimental study with the design of one group pretest-posttest design. The study population was students of the Mathematics Education Department at STKIP PGRI Sumatera Barat in the 2015/2016 academic year consisting of 3 classes. The sampling technique was done by purposive sampling. The use of student worksheets based on project and integrated information technology can significantly improve student learning outcomes in Space Geometry subject in the mathematics education department at STKIP PGRI Barat Sumatera

Keywords- effectiveness, student worksheets, project-based learning, the subject of Space geometry.

I. INTRODUCTION

National education aims to empower all Indonesian citizens to develop into quality and proactive human beings to answer the challenges of an ever-changing era. Students need to be prepared to face the challenges of the future, able to think critically, systematically, logically, creatively, and able to solve problems (Daryanto and Aris, 2014). This will be achieved if the learning process given to students is in accordance with the Process Standards, contained in the Regulation of the Minister of Education and Culture of the Republic of Indonesia No. 65 of 2013. The process of learning on a standard process is interactive, inspiring, fun and challenging, motivating students to actively participate and providing sufficient space for initiative, creativity, and independence in accordance with the talents, interests and physical and psychological development of students.

In fact, student learning outcomes in Space Geometry subject are still low and still below the standard in the Mathematics Education Department STKIP PGRI Sumatera. This is caused by the lecturers and students still using teaching materials in the form of old published textbooks that the language is not communicative so that it is difficult to understand. Lecturers have created student worksheets but the expected learning outcomes cannot motivate students to be active, creatively and independently involved in carrying out the learning process. Therefore, they have been developed student worksheet based on project and integrated information technology in the subject of Space Geometry. Student worksheets based on project and integrated information technology can facilitate students to find their own concepts according to their knowledge and skills (Chu, 2017). The use of student worksheets based

on proyek can encourage the creation of independent, interactive, inspirational, challenging, and motivating students in the learning process and will make learning more effective and efficient (Erkul and Kargin, 2014). The aim os study was to determine the effectiveness of student worksheets based on project and integrated information technology in the subject of Space Geometry.

II. METHODS

This type of research is a quasi-experimental study with the design of one group pretest-posttest design. The study population was students of the Mathematics Education department at STKIP PGRI Sumatera Barat in the 2015/2016 academic year consisting of 3 classes. The sampling technique was done by purposive sampling. Data analysis techniques learning outcomes about the effectiveness student worksheets based on project and integrated information technology, with the formulation:

$$t = \frac{M_d}{\sqrt{\frac{\sum X^2 d}{N(N-1)}}$$

III.

IV. Tests are carried out with reject criteria if, with a significance level of 0.05 (Arikunto, 2005)

V.

III. RESULTS AND DISCUSSION

Student worksheets based on project and integrated information technology in the subject of Space Geometry are arranged based on the stages contained in Project Based Learning. Student worksheets consist of 6 learning activities with Prisma and Limas material. This student worksheet discusses the properties, elements, networks, volume, and area of building space. Each section examines the results of the answers, students involve the Wingeom software to get problem-solving. Students find it easier to understand the nature of space and make networks build space after they are taught using Wingeom software.

Project-based learning steps: a. Start with the Essential Question. b. (Design a Plan for the Project c. Create a Schedule. Monitor the Students and the Progress of the Project. Assess the Outcome. Evaluate the Experience. This research was conducted on the subject of prism by discussing the characteristics and prism elements, prism nets, and volume and area of prism The study was conducted in 5 (five) meetings. The implementation of learning began by giving a pretest to determine the level of students' understanding of the material to be studied then students were divided into small groups Furthermore, at the second meeting held in a computer laboratory and students learn to use student worksheets with material and prism elements, students are given problems on the basic questions, students are asked to design project implementation, to evaluate their work. third meeting Working in groups can improve their way of thinking can not solve the problem better (Sudjana, 2002). Students emphasize their work and others respond and ask questions, then the lecturer gives reinforcement. At the end of the meeting, posttes were given to students who followed the geometry of space geometry. Posttest results can be seen in Table 1

Table 1. Results of pre-test and test post

Type of test	Mean	S	X _{max}	X _{min}
Pre-Test	51.52	40.09	79	25

Post-test 73.95 61.3 86 60

Calculation performed by test, the value of $t_r = 5.12$ with $N = 23$ and $\alpha = 0.05$, while $t_{table} = 1.68$. If the value of $t_r > t_{table}$, then H_0 is rejected. So it can be concluded that the average student learning outcomes are better than the average student learning outcomes before using project-based student worksheets and integrated information and communication (Figure 1).

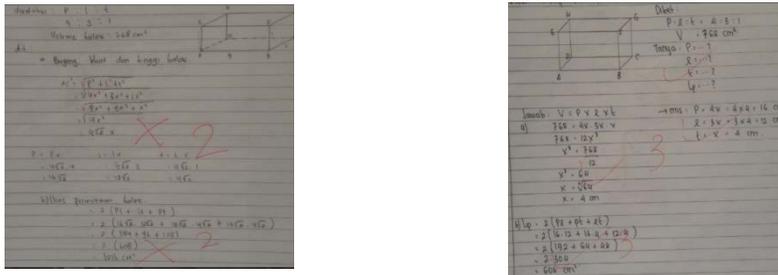


Figure 1. Results of student answers

Based on Figure 1, it can be seen that students have not been able to restate a concept and apply concepts or algorithms in problem-solving. Furthermore, in the posttest answers students have begun to be able to use formulas. This is due to the use of student worksheets based on project and integrated information technology. This student worksheet can help students add information about concepts learned through learning activities systematically and be able to enhance students' creativity and critical thinking (Garcia, 2016). The effectiveness test of student worksheets based on Mastery learning in Genetics subject can improve student learning outcomes (Megahati and Yanti, 2017).

Project-based learning is a systematic learning method that is able to involve students to improve their knowledge and skills through a structured process, real and rigorous experience designed to produce a product (Ravits, 2008). Student worksheets based on project and integrated information technology facilitate students to find their own concepts in accordance with their knowledge and skills (Chu, 2017). The use of student worksheets based on project can encourage the creation of independent, interactive, inspirational, challenging, and motivating students in the learning process and will make learning more effective and efficient (Ergul and Kargin, 2014). Project-based learning can improve cognitive abilities and skills of students in the learning process (Sart, 2014). The use of teaching materials based on project-based learning can make students actively and enthusiastically involved in following the learning process (Habok and Nagy, 2016).

IV. CONCLUSION

The use of student worksheets based on project and integrated information technology can significantly improve student learning outcomes in Space Geometry courses in the mathematics education program STKIP PGRI Sumatera Barat.

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AUTHORS

- First Author** – Hafizah Delyana, Mathematics Education Department, STKIP PGRI Sumatera Barat, Padang, West Sumatra, Indonesia.
- Second Author** – Radhya Yusri, Mathematics Education Department, STKIP PGRI Sumatera Barat, Padang, West Sumatra, Indonesia.
- Third Author** – Nurmi, Infomatics Education Department, STKIP PGRI Sumatera Barat, Padang, West Sumatra, Indonesia
- Fourth Author** – Alfi Yunita, Mathematics Education Department, STKIP PGRI Sumatera Barat, Padang, West Sumatra, Indonesia

Correspondence Author – Radhya Yusri, email address: radhyayusri01@gmail.com, contact number: +6281363 142221.

Reproductive Parameters of *Diastocera trifasciata* (Fabricius, 1775) (Coleoptera: Cerambycidae: Lamiinae), Cashew Branches Girdler in Côte d'Ivoire, Under Semi-Natural Conditions

Ettien Narcice AKESSE*, San-Whouly Mauricette OUALI-N'GORAN*

* Faculty of Biosciences/Laboratory of Zoology and Animal Biology, Center of Excellence on Climate Change, Biodiversity and Sustainable Agriculture, Félix HOUPOUET-BOIGNY University Côte d'Ivoire

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Abstract- In Côte d'Ivoire, the cashew nut still known as "brown gold" represents a hope for the populations of the producing zones and contributes to the international influence of the country. However, it is facing attacks from multiple insects including *Diastocera trifasciata* formerly *Analeptes trifasciata*. The lack of data on the reproductive parameters of the species motivated this study. The objective of this study was to provide knowledge related on the reproductive parameters of *Diastocera trifasciata*. The study was conducted under semi-natural conditions at a temperature of 26.83 ± 2.36 °C and a relative humidity of $75.37 \pm 15.09\%$. Forty-five pairs of adults were reared in insectarium to study the biology of the species. Data collected were analyzed with Statistica version 7.1 software. The study revealed a pre-mating period of 123.33 ± 8.45 days (mean \pm SE) and pre-oviposition period 1.83 ± 0.79 days. Oviposition period was 64.26 ± 8.88 days with lifetime fecundity of 174.3 ± 18.77 eggs and fertility rate $82 \pm 9.38\%$. In females, body length was 39.71 ± 2.74 mm and longevity was 196.97 ± 6.43 days. There is a positive correlation between longevity, lifetime fecundity, female size and fertility. In males, body length was 42.23 ± 3.03 mm and longevity 184.56 ± 7.47 days. Sex ratio was 0.73 in favor of females. Incubation period of eggs was 11.81 ± 1.22 days. Development duration are 198.2 ± 16.22 days for the larval stage and 18.69 ± 0.63 days for pupal stage. With a total life cycle 211.81 ± 18.87 days, *D. trifasciata* is univoltine species. The reproductive parameters of *D. trifasciata* were obtained. Knowledge of these parameters could be used to support the development of effective control strategies.

Index Terms- *Diastocera trifasciata*, branch girdler, reproductive cycle, longevity, lifetime fecundity, fertility.

I. INTRODUCTION

D *Diastocera trifasciata* (Fabricius, 1775), formerly *Analeptes trifasciata*, is a wood-boring insect that attacks cashew trees (*Anacardium occidentale*, Anacardiaceae) in several areas of West Africa [1, 2]. Its damage has been observed and described for the first in 1964 in the forest station Kokondekro to Bamoro and many smallholdings around Bouake in central Côte d'Ivoire [3]. Since the work of these authors, no other study has made a case of the biology and ecology of this species to determine effective means of control. In 2014, *D. trifasciata* has been identified as one of the main four major insect pests of cashew in the country [2]. This insect girdle and cuts a large number of branches and trunks causing up to 55% cashew nut yield loss [4]. It represents a serious threat on the farmers' yields and the country's economy [5].

The control technique used until now by producers in Côte d'Ivoire is to capture manually adults during periods of occurrence and killing them with machetes or grilling. This practice does not make reach all individuals and proves to be very inefficient with regard to the spread of growing outbreaks. In addition, this practice is not apply in the duration and the periods of application are ill-chosen.

Since the work investigated by [6] as well as those conducted by [3] which focused on the morphological description of this pest and this damage, no recent study has made any reference to the biological parameters of this species. The knowledge of biology and especially the control of reproduction is essential for the development of an effective control strategy.

The objective of this work is to know the reproductive parameters of *D. trifasciata*. Specifically, it is to determine the egg incubation period, the duration of the development cycle, female lifetime fecundity, fertility, duration of sexual maturation of adult, emergence rate, sex ratio and adult longevity.

II. MATERIALS AND METHODS

A. Study site

The study was conducted in the locality of Brobo located 20 km from Bouake on the axis Bouaké-M'Bahiakro, in the center of Côte d'Ivoire (latitude: 07°38.18N, longitude: 004°49.29W). The vegetation is herbaceous savannah, shrubby or wooded with forest islets mainly in the lowlands [7]. The study period extended from October 2015 to September 2017 in semi-natural conditions.

B. Material

B1. Biological material

The plant material used was branches and leaves of cashew obtained from the orchards of Brobo. These organs serve both as food for the individuals and as a female's egg-laying support. The adult used come from the branches of cashew trees containing eggs of *D. trifasciata* kept in rearing in the insectarium.

B2. Breeding device

Thirty wooden cages in the form of a parallelepiped of dimensions 80 cm x 60 cm x 60 cm were used for the rearing of adults. The four (04) lateral sides are in a metal screen of fine mesh of 2 mm for ventilation of cages. The base and the roof are plywood. One of the four lateral side serves as the door for cleaning droppings and dead individuals. The plywood of the roof is free to facilitate the renewal of the branches inside the cage. The temperature inside the insectarium was 26.83 ± 2.36 ° C (mean \pm SE) ranged from 22.6 - 32 ° C. The relative humidity was $75.37 \pm 15.09\%$ (mean \pm SE) (range 40.94 – 83). These data were recorded by a digital thermohygrometer MEDISANA. The shots were taken with a NIKON B700 digital camera. The measure of every instar of the insect were recorded with the help of a vernier slide caliper.

C. Study of reproductive parameters

C1. Adult pre-mating, mating and egg-laying

Forty-five pairs of adults (45 females and 45 males) newly emerged from the branches collected in different fields were observed in fifteen (15) cages at the rate of three pairs per cage. The body length of each adult was measured from the top of the head to the apex of the elytra using a vernier slide caliper. The date of emergence is noted. Individuals emerged from the same branch and from the same orchard were never put in the same cages to avoid consanguinity [8]. In each cage, small fresh branches of 10 to 15 mm in diameter and dried leaves of cashew trees are provided to insects as food. These branches are renewed every two days until observation of the first mating. The date of the first mating is noted. **Pre-mating period**, which is time elapsed between the adults' date of emergence and that of the first mating of each pair was recorded.

For mating and egg-laying experiments, as soon as the first mating are observed, the pair is isolated in another cage. In each cage, a branch of larger size whose circumference is between 15 and 25 cm is made available to them. This branch serves both food for the pair and female support for laying. Daily, branches are removed from cages and inspected to note the presence or not of laying. Oviposition pit is marked by the presence of gelatinous substance at the entrance of the holes [8, 9]. Egg counting is based on the presence of this substance. In case of death of the male before the female, it is replaced by another and observations continue. The dates and times of mating and laying are observed and noted until the death of the female. The date of female death is noted.

The **Preoviposition period** (elapsed time between first mating and first oviposition) the **oviposition period** which is elapsed time between first and last oviposition were determined.

The number of eggs deposited per female in the branches was recorded daily. The experiment continued until the death of the female. **Lifetime fecundity** (total number of eggs laid by a female during its life) was determined.

After the laying, the oviposition pit are inspected from the outside every day until the observation of wood dust coming out of these holes. Wood dust is powder from wood rejected by the larva during its feeding activity in the branch. As soon as detection of this wood dust, the pit is then opened to observe first instar larvae. Number of hatched and unhatched eggs was counted and **egg fertility rate** (percentage of the number of eggs hatched to the total number of eggs laid) was determined. **The longevity** (elapsed time between date of emergence and the date of death) was determined.

C2. Emergence rate and sex ratio

The emergence rate was studied on 76 fresh branches of average length 149.31 ± 53.34 cm collected in different orchards. These branches contain eggs newly laid. The number of eggs laid and laying date are recorded on each branch with permanent marker. They are then brought back to an insectarium to be stored on tables. They are followed until the emergence of adults. The number of emerged adults was noted. **Emergence rate** and **sex ratio** (number of males emerged on number of females emerged) were calculated.

C3. Incubation period, larval and pupal development of *D. trifasciata*

During attacks, 100 freshly girdled branches containing eggs were collected from different orchard of Brobo. These selected branches are those cut the day before the visits. They are recognized by the fresh state of the substance covering the oviposition pit. They were divided into 50 lots of 02 branches. The eggs are observable by superficial opening of the oviposition pit with a knife. On each branch, laying date and the number of notch containing the egg are recorded in the indelible marker. According to [10], the time between egg-laying and hatching of Cerambycidae eggs in general ranges from 3 - 7 days but can be up to 25 days. A batch of two (02) branches is dissected every three (03) days during the first month following the laying date to observe the evolution of the eggs. The number of hatched eggs was noted at each observation and the date of hatching was also on each branch. **Incubation period** (time elapsed between egg laying and hatching) has been recorded.

The determination of larval and pupal duration was made from the 50 lots of branches formed. After hatching, the branches are dissected every seven (07) days for seven (07) months to see the evolution of the larvae until observation of pupae and adult emergence. After dissection of the branches, the shape, the dimensions and the color of the observed stages are described. The following parameters were recorded: **duration of larval development** (elapsed time between the date of hatching of the eggs of the moulting pupal), **duration of pupation** (time that covers the process that allows the passage of larvae of last stage to the pupa), **duration of pupal development** (elapsed time between the date of the pupal moulting and that of obtaining the adult), **duration of development cycle** (elapsed time between the date of egg laying and obtaining of the adult stage).

D. Data Analysis

Data processing was done using Statistica software version 7.1 StatSoft [22]. A one-way analysis of variance (ANOVA) followed by the Newman and Keuls test at the 5% threshold allowed the averages to be compared. Linear regression analyses (Pearson's correlation) was used to test the correlation between some reproductive variables in females (lifetime fecundity, fertility, longevity, oviposition period, and female length) and in males (pre-mating period, longevity and body length).

III. RESULTS

A. Pre-mating and pre-oviposition periods of adults

The individuals made the first mating between the 104th and 138th days after emergence, pre-mating period of 123.33 ± 8.45 days (mean \pm SE). Mating takes place during the day. The first oviposition was observed between the 1st and 4th day after mating, pre-oviposition period of 1.83 ± 0.79 days (mean \pm SE). Pre-mating and pre-oviposition periods are not correlated with any of the biological parameters studied in the female in this study (Table 1).

Table 1: Linear regression analyses (Pearson’s R correlation matrix) between the different parameters of the female of *D. trifasciata* in semi-natural conditions (temperature 26.83 ± 2.36 °C and relative humidity 75.37 ± 15.09 %)

Parameters	Pre-mating period (days)	Longevity (days)	Oviposition period (days)	Pre-oviposition period (days)	Lifetime fecundity	Body length (mm)
Pre-mating period (days)	1					
Longevity (days)	0.356 ns	1				
Oviposition period (days)	-0.058 ns	0.315 ns	1			
Pre-oviposition period (days)	-0.058 ns	0.114 ns	-0.087 ns	1		
Lifetime fecundity	0.291 ns	0.958*	0.265 ns	0.181 ns	1	
Body length (mm)	0.270 ns	0.813*	0.155 ns	0.259 ns	0.875*	1
Fertility	0.076 ns	0.477**	0.608*	-0.035 ns	0.518**	0.424***

Significance of P-values: ns: non-significant; * $P < 0.0001$; ** $P < 0.01$; *** $P < 0.05$

B. Oviposition period, lifetime fecundity, fertility rate and longevity of adults

Egg-laying begin at dusk and end at dawn. Oviposition period was 64.26 ± 8.88 days (mean \pm SE). Female lifetime fecundity was 174.3 ± 18.77 eggs, ranged from 126 - 200 eggs. On 174.3 ± 18.77 eggs laid per female, 143.46 ± 22.92 hatched, fertility rate was $82 \pm 9.38\%$ (mean \pm SE). Males of *D. trifasciata* emerge firstly but a longevity was 184.56 ± 7.47 days (range 168 – 201). In females, longevity was 196.97 ± 6.43 days (range 178 - 208) (Table 2). The linear correlation test shows that there is a positive correlation between female lifetime fecundity, longevity and egg fertility (Figure 1) (Table 1). There are significant difference between the longevity in males and females ($F = 47.43$, $ddl = 1$, $P < 0.05$).

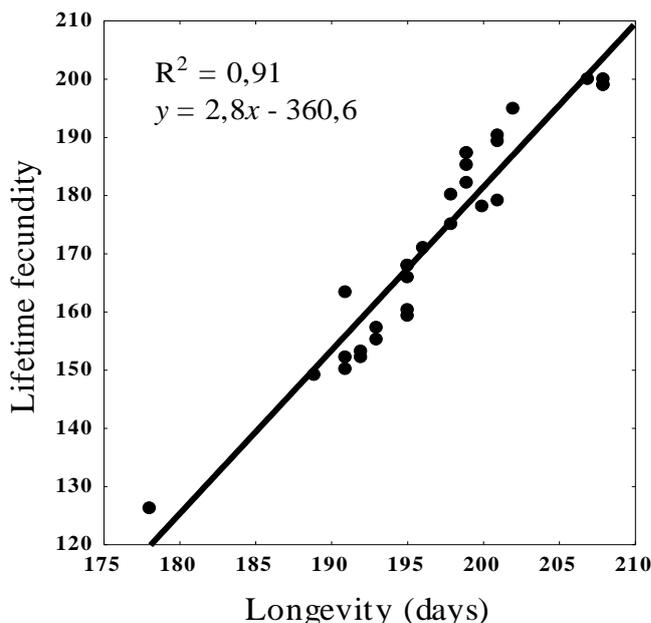


Figure 1: Correlation between female longevity and lifetime fecundity

C. Correlation between adult length, fecundity and longevity

In female, body length was 39.71 ± 2.74 mm (means \pm SE), ranged 33.10 - 43.50. The linear correlation test between female length and lifetime fecundity shows that large females lay more eggs ($R = 0.87$, $P < 0.05$) (Figure 2). Female length is also positively correlated with longevity ($R = 0.81$, $P < 0.05$) (Figure 3). There were mating between some females who lost their male partners and newcomers. Females were therefore polyandrous and males were polygynous. In males, body length was 42.23 ± 3.03 mm (range 31.49 - 46.20). Males are larger in size than females. Analysis of variance at the 5% threshold showed that there is a significant difference between the body length in males and females ($F = 11.38$, $ddl = 1$, $P < 0.05$). The sexual dimorphism is marked by the length of the antennae which is 59.72 ± 4.88 mm in the males against 47.98 ± 6.77 mm in the females (Table 2). Male length correlated neither with longevity ($P > 0.05$, $R^2 = 0.002$) nor with the pre-copulation period ($P > 0.05$, $R^2 = 0.001$).

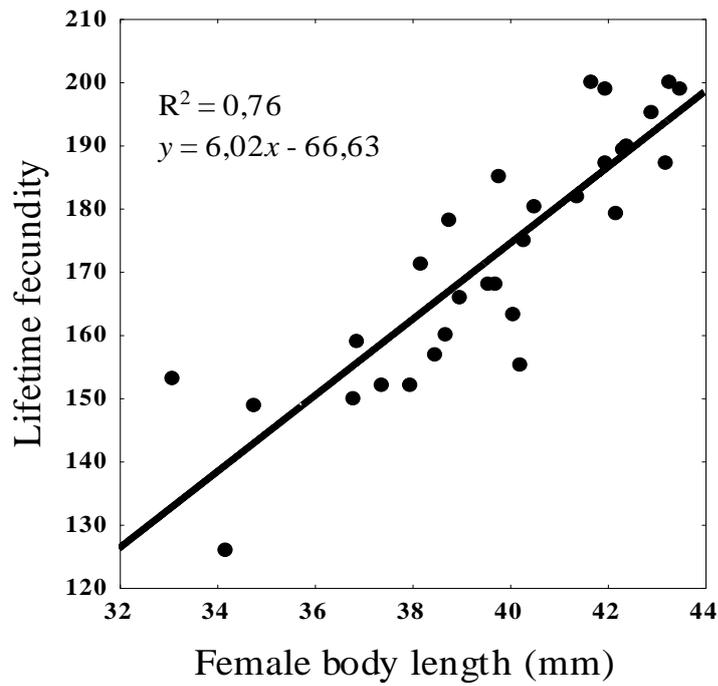


Figure 2: Correlation between female body length and lifetime fecundity

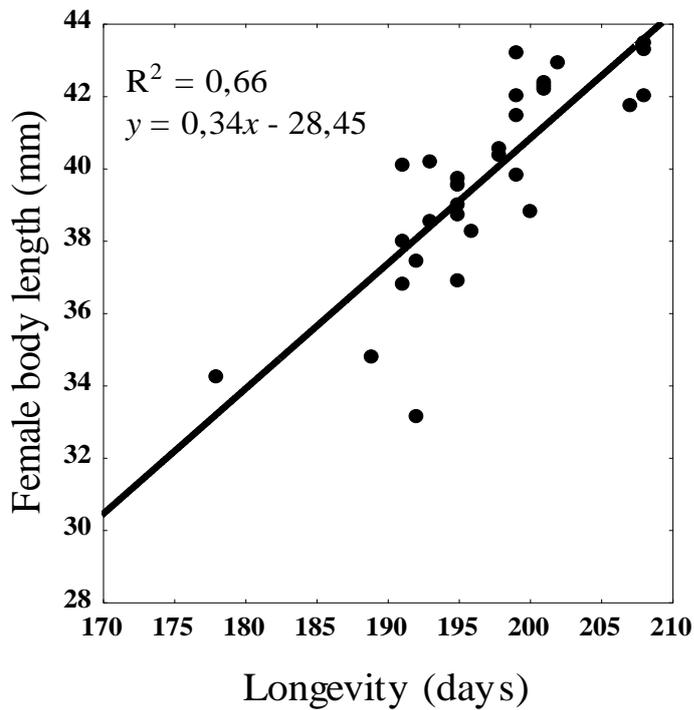


Figure 3: Correlation between longevity and female body length

Table 2: Some morphological characteristics of adults of *D. trifasciata*

Sex	Body length (mm)	Antennae length (mm)	Longevity (days)
Males	42,23 ± 3,03 (31,49 - 46,20)	59,72 ± 4,88 (50,8 - 69,95)	184,56 ± 7,47 (168 - 201)
Females	39, 71 ± 2,74 (33,10 - 43,50)	47,98 ± 6,77 (38,18 - 59,41)	196,97 ± 6,43 (178 - 208)

n = 45 in each sex; Mean ± SE (Standard Error of the mean); (minimum – maximum values)

D. Emergence rate and sex ratio of *D. trifasciata*

Out of a total of 2953 eggs monitored, only 247 adult individuals have emerged, an average emergence or rate of 8.36%. The emerged adults are divided into 142 females and 105 males, a sex ratio of 0.73 in favor of females.

E. Egg of *D. trifasciata* and incubation period

The laying were recorded between 18h and 07h in the morning. The eggs are laid in notches made in the bark by the females only. Each notch of eggs contains only one egg disposed parallel to the longitudinal axis of the branch or stem cut (Figure 4a-b). The newly laid of *D. trifasciata* egg is white, oval and similar to a rice grains (Figure 4 b). Eggs length were 5.52 ± 0.23 mm (mean ± SE), ranging from 5.04 - 6.1 mm. The width of the eggs ranged 1.05 - 1.71 mm with a mean of 1.28 ± 0.11 mm. The incubation period of the eggs was 11.81 ± 1.22 days (range 9 – 15).

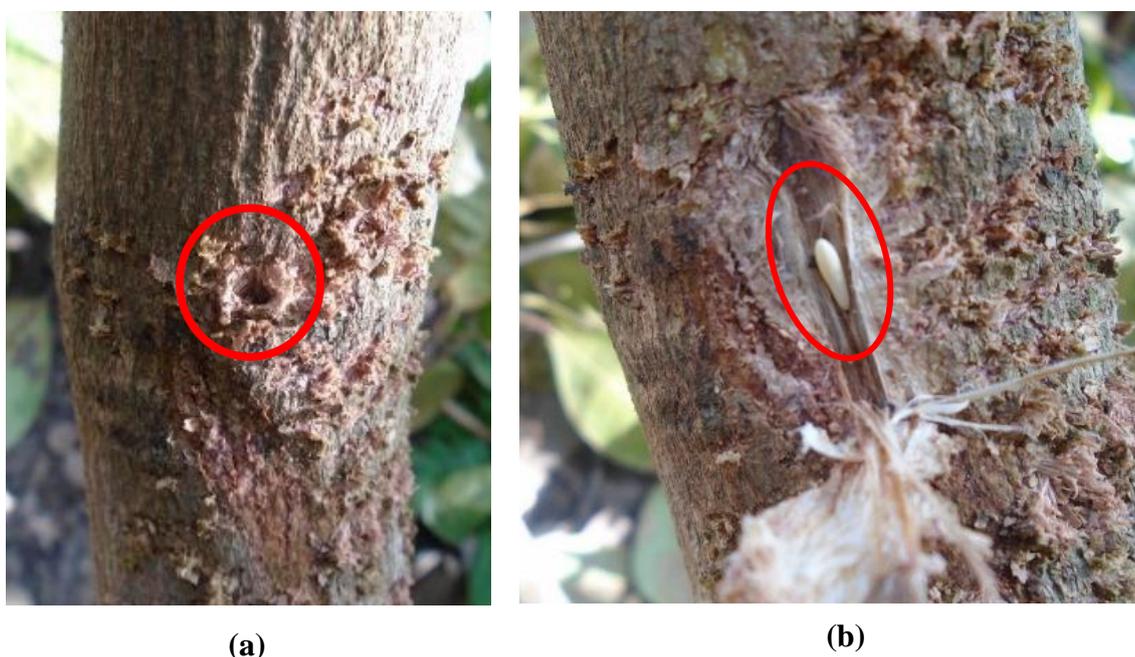


Figure 4: Laying site and fresh eggs of *D. trifasciata*

(a) Laying notch (red encircled); (b) egg (red encircled) still inlaid in the branch

F. Larval and pupal development of *D. trifasciata*

The first instar larvae of *D. trifasciata* are translucent rosy white color. The body length of larvae (mean \pm SE) was 6.39 ± 1.20 mm (range 4.80 - 8.70). The body width was 1.34 ± 0.16 mm (range 1.01 - 1.77). The length of late-instar larvae was 36.45 ± 4.56 mm (range 27.60 - 48.12). The width of late-instar larvae was 7.72 ± 1.2 mm (range 5.8 - 10.60). They are cream-white tinged with yellow and it is located under the bark. The duration of larval development was 198.2 ± 16.22 days (range 169 - 226).

Before the end of their development, the larvae reduce their gallery in the wood to construct a pupal chambers. At the ends of this chamber are piled woody debris undigested that look like sawdust. Pupation and pupal development occurs at the end of the larval development in this pupal chamber. The length of the pupal chamber was 89.26 ± 13.01 mm (range 55.1 - 135). Its width was 24.95 ± 3.36 mm (range 15.7 - 34.9). The pupation duration was (mean \pm SE) 9.02 ± 2.13 days.

The pupa is white or black according on whether it is at beginning or end of its development. The head is inflected toward the ventral side and carries the antennae which are elongated dorsally along the body before wrapping in a spiral at the end on the legs. The wing cases are concealed under the folded legs on the ventral side. The length of the pupae was (mean \pm SE) 38.64 ± 2.99 mm (range 32.5 - 46.9). The width was 10.66 ± 1.11 mm (range 8.1 - 14.7).

Pupal development occurred between days 16 and 19 after pupation, for an average duration of 18.69 ± 0.63 days. The young imago who comes out, the wings and the whole body were soft. The head, legs and abdomen have a grey and black color at the joints. The bands of the wings have a grey coloration. The average duration of pigmentation is 3.68 ± 1.03 days (mean \pm SE).

G. Duration of the development cycle of *D. trifasciata*

The duration of the life cycle was 211.81 ± 18.87 days (range 167 - 240). *D. trifasciata* is therefore a species univoltine. The adult, once the pigmentation is complete, emerges through a circular hole made with his mandibles in the bark covering pupal chamber. The diameter of these exit hole was 17.63 ± 2.43 mm (mean \pm SE) (range 11.4 - 28.1) (Figure 5).

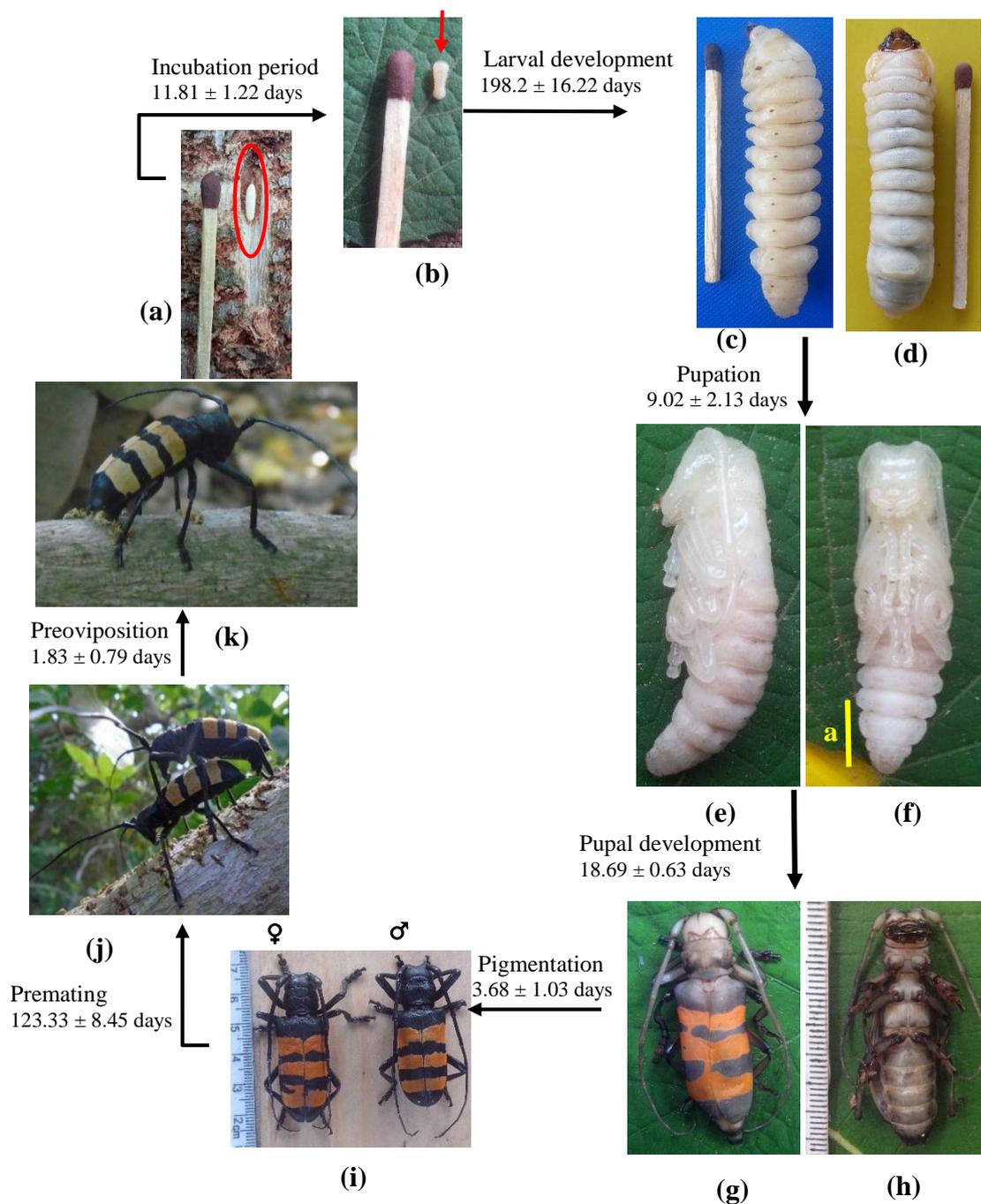


Figure 5. Life cycle of *Diastocera trifasciata* (Coleoptera: Cerambycidae: Lamiinae) under semi-natural conditions (temperature 26.83 ± 2.36 °C and relative humidity $75.37 \pm 15.09\%$).

(a): egg (red encircled) observed after opening of a notch; (b): first instar larva (red arrowed); (c) : late instar larva lateral view; (d): late instar larva ventral view; (e): pupa lateral view; (f): pupa ventral view; (g): young imago (not emerged from branch) dorsal view; (h): young imago (not emerged from branch) ventral view; (i): adults emerged; (j): mating on cashew branch; (k): female laying in a cashew branch.

Scale a: 0.79 cm

IV. DISCUSSION

In this study, the results revealed that the pre-mating period was 123.33 ± 8.45 days. This period is very high compared to that of Cerambycidae of the Lamiinae subfamily, whose adults feed from a few days to three weeks before becoming sexually mature [8, 12]. Among Cerambycidae *Anoplophora glabripennis* (Motschulsky), adult females become sexually mature about 9 to 17 days after emergence. The pre-mating period of *D. trifasciata* is explained by the fact that Cerambycidae Lamiinae are synovigenic pattern that do not mate immediately after emergence. Adults emerge with immature sexual organs. They must feed on young shoots and dry leaves for a period ranging from several days to weeks before reaching sexual maturity [8, 13]. The duration of this period may also depend on the phenology of the host plant *Anacardium occidentale*. Indeed, the mating period begins when the plant begins its push vegetative pre-flowering and extends until flowering. There would be a synchronization between the reproductive period of *D. trifasciata* and that of the host plant. According to [14], this phenomenon of synchronization of the cycle of insects and their host plant is frequent and determines the quantity and the quality of the resources available for reproduction.

The pre-oviposition period obtained in this study (1.83 ± 0.79 days) is close to that obtained in Cerambycidae *Cerambyx welensii* which is 2.8 ± 0.2 days, investigated by [15].

The oviposition period of *D. trifasciata* recorded was 64 ± 8.88 days. These observations are close to those of Cerambycidae Lamiinae that have an oviposition period of 60 ± 7 days [14]. On the other hand, in the species of the subfamily Cerambycinae, the oviposition period was 41 ± 17 days [15].

Regarding female's lifetime fecundity (174.3 ± 18.77 eggs) in breeding condition is superior to the lifetime fecundity in Cerambycidae Lamiinae which is 155 ± 30 eggs [14]. [16] showed a higher fecundity of 284 ± 27 eggs in the female Cerambycinae *Phoracantha recurva*. The positive correlation between fecundity and female size shows that larger females lay more eggs than smaller females. According to [17], female size is usually a good indicator of potential fecundity.

The phenomena of polyandry and polygyny were observed respectively in females and males of *D. trifasciata* as in *Cerambyx cerdo* [18]. The egg fertility rate recorded in *D. trifasciata* was $82.37 \pm 9.38\%$. This result is close to those of Cerambycidae such as *Anoplophora glabripennis* which is $83 \pm 2\%$ [19], *Cerambyx cerdo* $78 \pm 1\%$ [17]. On the other hand, other authors have recorded a fertility rate ranging from 90 to 98%, in *Monochamus galloprovincialis* and *Phoracantha semipunctata* [16, 20]. Rates of between 48-66% were in *Anoplophora glabripennis* [21].

Adult males measure 42.23 ± 3.03 mm and live 184.56 ± 7.47 days while females measure 39.71 ± 2.74 mm and live 196.97 ± 6.43 days. This difference in longevity has been reported by various authors. In Cerambycidae, females generally live longer (54 ± 6 days) than males (42 ± 6 days) for a given species [15, 22]. Adults' longevity of *D. trifasciata* could be influenced by the long period of nutrition that precedes reproduction. According to [23], the adult phase of Cerambycidae is entirely devoted to reproduction. Female longevity was positively correlated with lifetime fecundity, egg fertility. Similar results have been obtained in other Cerambycidae [15, 24]. Longevity can also be influenced by body size, although factors such as temperature, diet, and overall health of an individual may play a larger role [25].

The emergence rate obtained in this study was 8.36%. These results are quite similar to those of [26] who recorded an emergence rate of 12% in adults of Cerambycidae *Monochamus carolinensis*. These findings could be justified by competitions within the branches at the time of larval life. Indeed, various studies have shown that competition for food resources in cases of high larval density increases the mortality rate in Cerambycids and / or decreases the body weight of adults. The cannibalism in the larval stage may occur when competition is intense [10, 27].

The sex ratio obtained in *D. trifasciata* was 0.73 in favor of females. But in Cerambycidae *Monochamus galloprovincialis*, the sex ratio is in favor of males [8].

The incubation period of *D. trifasciata* obtained was 11.81 ± 1.22 days. These results are similar to those of [10] who reported that the time between egg-laying and hatching of eggs' Cerambycidae varies from 3 to 7 days in general but can go up to 25 days.

In this study, the total duration of larval development of *D. trifasciata* (198.2 ± 16.22 days) is close to that obtained by [28] who reported that the larval period of Cerambycidae *Monochamus leuconotus* was approximately 210 days. In *Anoplophora versteegi* and *Aeolesthes holosericea*, larval development requires respectively 263.0 ± 22.64 days and 516.9 days [29, 30]. The duration of pupal development of *D. trifasciata* was 18.69 ± 0.63 days. It is similar to that recorded in *Anoplophora versteegi* which is 25.76 ± 2.77 days [29]. On the other hand, this duration is 145.16 ± 29.10 days in females of *Plocaederus ferrugineus* [31].

After pupal development, adult stay 3.68 ± 1.03 days in the pupal chamber before emerging from the exile hole. This time is important because many physiological changes occur in these recently emerged adults of the pupal development, including the pigmentation of the exoskeleton. This process may take several days before the young adult emerges from the wood through a circular hole as mentioned by [32] as well as [8].

The complete lifecycle of *D. trifasciata* under rearing conditions was 211.81 ± 18.87 days. These results are close to those obtained on *D. trifasciata* by [3]. Indeed, these authors observed emergence of adults by mid-June from laying at the end of November, about 210 days after laying.

V. CONCLUSION

This study was motivated by the almost total absence of data on the biological parameters of *D. trifasciata*. The study of the development cycle made it possible to determine for the first time the reproductive parameters of this species. The pre-mating and pre-oviposition periods were 123.33 ± 8.45 days and 1.83 ± 0.79 days, respectively. Lifetime fecundity 174.3 ± 18.77 eggs was obtained with a fertility rate $82 \pm 9.38\%$. Longevity of *D. trifasciata* was 184.56 ± 7.47 days in males and 196.97 ± 6.43 days in females. The emergence rate was 8.36% and the sex ratio has been in favor of females. The results revealed that *D. trifasciata* is a univoltine patterns species with a total development cycle duration of 211.81 ± 18.87 days. The knowledge of the reproductive parameters of *D. trifasciata* could help identify the appropriate methods and times of intervention in developing effective control strategies.

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AUTHORS

First Author – Ettien Narcice AKESSE (PhD student), Félix HOUPHOUET-BOIGNY University, Center of Excellence on Climate Change, Biodiversity and Sustainable Agriculture, Côte d'Ivoire, narcice1985@gmail.com, 00225 09 91 14 45.

Second Author – San-Whouly Mauricette OUALI-N'GORAN (Dr.), Félix HOUPHOUET-BOIGNY University, Center of Excellence on Climate Change, Biodiversity and Sustainable Agriculture, Côte d'Ivoire, ngoransw@yahoo.fr, 00225 07 40 57 05

Correspondence Author –Ettien Narcice AKESSE, PhD student, Félix HOUPHOUET-BOIGNY University, Center of Excellence on Climate Change, Biodiversity and Sustainable Agriculture, Côte d'Ivoire, narcice1985@gmail.com, 00225 09 91 14 45.

Radio As A Veritable Tool For Sensitizing The Public On The Implications Of Vote Buying And Selling In Nigeria Elections.

Ejue, Kris Ejue
Department of Mass Communication
Cross River University of Technology, (CRUTECH) Calabar.
&

Etika, David Nandi
davidetika1@gmail.com
07066037924
Department of Mass Communication
Cross River University of Technology, (CRUTECH) Calabar.

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Abstracts

Vote buying is a trending phenomenon in our present days politics. This problem is flourishing by the day. In 2011 elections, there were trivial cases of vote buying. It is believed that moneybag politicians introduced vote buying after the introduction of electronic voting system in 2015, which barricaded their former gimmicks of rigging and ballots box snatching. The election that brought president Mohammendu Buhari was allegedly characterized by vote buying. Desperate political actors who want to win by all cost, having seen that good party manifestoes and integrity of candidates jostling for public offices are not longer enough to assure electoral victory. Thus, they resorts in vote buying. The paper examine radio as a veritable tool for sensitizing the public on the implication of vote buying and selling in Nigerian elections. The paper used agenda setting theory. The paper concluded that democracy is the best form of government, as we need to protect it by saying no to vote buying. We need to strengthen our

electoral institution to ensure sanity and sanctity of our democracy. Furthermore, vote buying and selling is an emerging trend that threaten Nigeria democracy and it can be curbed by the sundry recommendations that are made in this paper.

Keywords: Radio, mass media, electorate, vote, democracy, buying and selling

Introduction

Democracy is perceived to be government of the people by the people and for the people. Most nations of the world practice democracy. In Nigeria, democracy is the system of government practiced. Prior to independence, Nigeria was controlled by the British government who colonized her. On the first of October 1960 Nigeria got her independence and shortly after that, the fight, resistance, and reprisals that tore the country apart broke out and continued for a year and a half. Prime Minister Abubakar Tafawa Balewa, serving a second consecutive five year term, contended that he was helpless to correct the situation. Then the Nigerian military took action. On January 16, 1966, a section of the Nigerian army led by Major Kaduna Nzeogwu mutinied and killed all civilian leaders and some senior military personnel. Included among the slain politicians were the Prime Minister; Chief S. L. Akintola, Western Region premier; the President of NPC, the Sardauna of Sokoto and several other ministers.

Nigerian citizens had been hoping for a change and so welcomed the military mutiny. But it soon became evident that the mutiny was the work of partisans from the Eastern Region, another example of the regionalism that continued to disrupt efforts at national unification. During the mutiny, none of the corrupt political leaders of the Eastern Region had been killed, the President himself having been away on a "health cruise" abroad; no senior military personnel of Eastern Regional origin had been killed; and the leader of the mutiny was from the Eastern Region. The commander of the Nigerian army, Major General Aguyi Ironsi, on January 17, 1966, officially took command of the country, assumed all powers of the Nigerian government, and arrested the military mutineers. The steps taken by Ironsi restored some confidence in the citizens, particularly the Western and Northern tribes, and the tribes hoped for a speedy trial and

conviction of the mutineers. Soon, however, reports circulated that Major General Ironsi did not intend the mutineers to stand trial. Quite to the contrary, the mutineers were receiving full army salaries and benefits. Jonathan (1974, p.28-29).

Nigeria began to practice democracy in 1999 after the military ruled for about two decades plus. Their government was characterized with coercion, suppression of human rights, intimidation, unnecessary anxiety, restriction of movements, suppression of press freedom and lots more. This form of government is not healthy for citizenry of any nation. It is considered as a dystopia form of government that pedestrianized human rights. Therefore, it is not worth considering.

Nigeria finally returned to democratic system in 1999, though there were several attempts made earlier by the past military rulers to pave way for democracy. One of which was General Ibrahim Babangida. Having ruled for eight years, he gave room for election to be conducted to give Nigerians the opportunity to be among the nations that practice democracy in the world. But unfortunately, the election was annulled by him after MKO Moshood Abiola won his contender Ahaji Bashir Tofa.

The perennial efforts yielded results shortly after the demise of General Sani Abacha in 1998. General Abdusalami Abubakar took over the leadership after Abacha's dead. And after he ruled for a year, from 1998 to 29 May 1999, he gave chance for the reign of democracy fully in Nigeria to operate freely. Since then, Nigeria has enjoyed 19 years of unbroken democracy. But the issue of vote buying is a conundrum to our democracy, it is a threat to democracy. Just recently, the just concluded Ekiti State governorship election experienced drastic cases of vote buying. Electorates were allegedly influenced to sell votes. The level of inducement by moneybags politicians was alarming, the people were openly influenced to sell votes for N3000, N4000 and N5000 to their detriment.

This was attributed to poverty, and it is a bad sign to 2019 general elections. Ekiti state governorship election was a testament of 2019 elections. Whatever that transpired negatively that is against the electoral Act, is a skeleton of what will happen in 2019 general elections if not redressed. The electorates need to be left alone to decide who they want. The trend of vote buying is not an emerging phenomenon, this act has been going on since the inception of

democracy in Nigeria. But the rate at which the act is proliferating shows the volume of aspirant's desperation.

Westminster Foundation for Democracy (2018) opined that money has become a dominant, determinant factor in Nigeria's politics. The poor are likely to be victimized by vote buying because their limited means makes them susceptible to material inducements, including offers of basic commodities or modest amounts of money. Vote buying, in its literal sense, is a simple economic exchange – candidates 'buy' and electorates 'sell' votes, as they buy and sell goods and services.

Radio is one of the mass media instruments, it plays role of transmitting information to the public as events unfold. Radio involves the process by which messages are sent through electrical waves. In other words, sound would be sent and received through the waves (Sambe, 2008:75). The history of Radio dates back to the 19th Century when Samuel Morse invented the electric telegraph. According to Bittner (1989:93), Guglielmo Marconi built on this invention to produce electromagnetic impulses which would be sent through the air without the use of wires.

The voice was carried over long distances. Thus in 1866, signals were transmitted from England to America without wires. (Sambe 2008:75) posited that in 1888, Heinrich Hertz, working on the electromagnetic theory propounded earlier by a British scientist James Clark Maxwell, produced the first radio waves. What is known today as Television was coined by a Frenchman called Persky. And the word is made up from Greek tele meaning at a distance and the Latin Videre means to see. Boris Rozing, a Russian, is said to be the first person to build a television system. In fact, he is regarded as the Father of Television. In 1923, another Russian, Vladimir Zworykin improved on Boris Rozing. He developed and presented to the world an electronic camera known as iconoscope. Further, according to Idebi (2008:1) the word Radio is defined as the process of sending and receiving messages through the air, using electromagnetic waves. It is also about the activity of broadcasting programmes for people to listen to the programmes being broadcast. Akpede, Josef, Oladokun, Christine, and Chidinma (2018, p.9).

Objectives of the Study

The objectives of the study was to assess radio as a veritable tool of sensitizing the public on the implications of vote buying and selling in Nigeria.

Literature Review

The concept of Radio

Akpede, Josef, Oladokun, Christine, and Chidinma (2018, p.10) asserted that "radio can be defined as a medium used for sending and receiving messages through the air using electronic waves". It is also about the activity of broadcasting programmes for people to listen to being broadcast (Idebi, 2008:1). It can also be defined as the broadcasting of programmes for the public to listen to. It is equally the system of sending sound over a distance by transmitting electrical signals (BBC English Dictionary, 1992:946).

The growth of radio in Nigeria has been a slow but interesting process. Radio was introduced in Nigeria as a wired system called radio distribution or radio re-diffusion by the British Broadcasting Corporation (BBC). In this process, wires were connected to loudspeakers installed in houses of subscribers. The wireless system was introduced by the BBC in 1930. The wired broadcasting services were commissioned in Lagos on December 1, 1935, and two relayed stations were located at Ikoyi and the Glover Memorial Hall, both in Lagos.

The main duty of the relay was to carry BBC programmes, with just one hour available for local programmes featuring news, entertainment as well as local announcements. Other stations were later opened at Ibadan in 1939, Kano 1944, Kaduna, Enugu, Jos, Zaria, Abeokuta, Ijebu Ode, Port Harcourt and Calabar in the subsequent years. The colonial government then came up with a policy to carry out a survey on radio broadcasting in all the British colonies including Nigeria. A committee was set up headed by L. W. Turner of the BBC Engineering Department and F. A. W. Byron of the Telecommunications Department of the Crown Agents. The committee recommended a wireless system of broadcasting for the colony of Nigeria.

According to (Ladele 1979), cited in Sambe (2008:83), an old building on 32 Marina, close to the General Post Office, was renovated as temporary headquarters. In addition, the Kaduna and Enugu Radio Diffusion Services were restructured and converted to regional broadcasting houses. The Radio Diffusion Services (RDS) later became the Nigerian Broadcasting Service (NBS) and was basically concerned with satisfying the programme needs of its audience, with the traditional role of informing, educating and entertaining the audience

members. The NBS put up a remarkable performance, especially during the visit of Queen Elizabeth II to Nigeria. The NBS upheld the role of impartiality; the colonial government on the other hand did not give all the Nigerian nationalists the opportunity to react to accusations leveled against them.

Against this backdrop, the Nigerian Broadcasting Corporation was established on April 1, 1957, to replace the NBS. The establishment of NBC marked the first public broadcasting corporation established in any British colonial territory. But not satisfied with the new arrangements, the Western Regional Government established its radio and television station in 1959. Eastern Nigeria followed suit in 1960 on the day Nigeria had its political independence from Britain. Northern Nigeria followed same in 1962. Today, virtually all the states own and operate both radio and television stations. Akpede, Josef, Oladokun, Christine, and Chidinma (2018, p.33-34).

Naghmana (2012, p.71) validated that "the potentials of Radio as a tool of social development is being utilized throughout the globe, be it developing or developed world". It has a long history of penetration at grassroots through community radio in the western world. In Asia, though community radio is comparatively a new arrival, but over the years, community radio broadcasting has made its roots and playing a vital role in the development of small communities. In Pakistan, radio has for long remained a state monopoly. After the promulgation of PEMRA Ordinance in the year 2002, the electronic media in private sector is emerging at a fast pace. Besides issuing a large number of licenses for FM radio it is catering to the entertainment needs of urban elites only, while community radio is still a far cry in the Country.

With the rampant illiteracy, unemployment, ignorance and multiple social and ethnic issues, the usage of radio as an agent to bring about social change is the demand of time. Since the community radio has the potential to ensure maximum community participation in the development processes, therefore in our opinion it is high time for Pakistan to take initiatives in this direction.

Radio developed in very different ways in different parts of the globe. Before the first radio broadcast in 1920's the world of information and communication was confined to few literate urban, those who could purchase and read newspapers. The invention of radio virtually

radicalized the process of social communication. It was envisaged as a democratic medium also, and was operated and controlled differently in different parts of the world. In United States it is a synonym for competition and commercialism. In Europe and its colonies including the subcontinent, radio operated under centralized state control. In Canada there is a combination of the two, a strong centralized State network on the national level and competition and commercialism on the local level. In Latin America they developed a mixture of all, private, church, university, special interest and indigenous people radio stations. With the passage of time the models of radio broadcasting kept on changing throughout the world.

Onozare, (2016, p.9) stated that "radio is the chosen medium because it is relatively cheap and available, there is also an adequate radio broadcasting infrastructure in Nigeria which has existed since the 1940's" (Umar 1997) Also, and most importantly, the Northern audience is considered to be essentially a listening audience (Yusuf, 2003) As a rural- oriented medium, the radio is believed to have a multiplier effect as A tells B what he heard on radio and so on. This is especially true of rural radio which increases the capacity for knowledge sharing and potentially the rate of development through community involvement.

Mass Communication and Development scholars like Akinfeleye (2008) and Quebral (1973) are of the opinion that, the mass media (in this case radio) constitute both "cause" and "effect" of development where "cause" is the mass media programmes in terms of broadcast media messages and "effects" is the response to the stimuli of messages (Dominick, 2010). In addition to these radio has some unique features which include portability, cheapness, universality and selectivity (Dominick, 2010).

According to Umar (1997) in Onozare (2016,p.10) he asserted that "in Nigeria and indeed most African states, broadcasting, that is radio and television, are used as tools for promoting development at least in theory". In practice however entertainment seems to dominate though development is supposedly the major objective with entertainment formats being used for educational purposes (Nwuneli, 1985) cited in Umar (1997):

*"Radio stations seem to devote a high percentage of their
airtime to purely entertainment programmes while other*

informational types of programming are presented in such a way that they appeal only to the educated elite leaving out the majority of the population who are rural based and largely uneducated”.

Rural Radio / Community Radio

Linje (2008, p.12) averred that "rural radio, on the other hand, refers to both broadcasting strategies (where centralized broadcasters produce programmes meant for rural audiences) and decentralized broadcasting stations that are located in rural areas" (these can be commercial, community, government or rural networks) (Manyozo, 2007; Hambly Odame and Atibila, 2003). While rural radio focuses on development needs, and is located in local rural areas and within indigenous knowledge structures and processes, community broadcasting focuses on correcting social and economic marginalization and is thus more correctly referred to as an alternative media source (Keita, 2001; White, 1990; Ilboudo, 2001, 2003; Da Matha, 2001; Castello, n.d; Hambly Odame, 2001; Pickstock, 2005).

Naghmana (2012, p.72-73) observed that despite its diverse origin and expanded networks, the commercial radio makes very little use of its special opportunities for local communication throughout the world. Normally such stations quickly linked up into networks in order to enlarge their distribution area and advertising revenue. They also have their major focus on easily consumable music programmes. Similarly the public service providers or state radios also keep on increasing their coverage area may be due to political and other reasons and keep the national distribution objective on their priority. A third type of radio therefore emerged in between these two, aiming neither at profit nor at geographical expansion, and has been able to establish itself.

As an alternative to commercial and State radio stations, most distinguished characteristic of community radio is its commitment to community participation at all levels. The concept behind this type of radio station is to ensure public participation at all possible levels; here listeners are also producers, managers, directors, actors and financiers. The popularity of this kind of radio lies in the fact that these are aimed at working for those who are at the margins of society and for those who seek change but are far away from the mainstream media. The role of

community radio is to respond to the priorities set by the community, to facilitate their discussions on issues confronting them and to reinforce their social development agenda through communication. These community run and managed radio stations eventually provide voices to voiceless throughout the world.

Salient Features of Community Radio

- UNESCO defines community radio as radio run by, for and about a community. This broad principal distinguishes between; state-owned or public service broadcasting, commercial broadcasting and community radio.
- Community radio is not for profit. This does not mean that community radio can not engage in revenue generating activities, which tends to be vital for survival and sustainability. This means its main objective is not revenue generation like commercial radio.
- Community radio incorporates open access in some form. In some station all broadcasters are volunteers while at some other it is a mix of volunteers and paid staff. Not only this, it is also managed by the community itself. The communities are involved in active ownership of the station. This is usually done by the community electing a management committee for the station.
- The programming is all about the community, of direct relevance to them. It needs to be community specific.
- The main difference between community radio and state owned radio is the concept of community ownership. This empowers the community to use this radio for community benefits like, poverty eradication, reducing gender disparities, health, hygiene, and much more. Naghmana (2012, p.72-73).

Functions of Radio in Sustaining Democracy

Radio is part of broadcast media which consists of radio/television. The broadcast media play a symbiotic role though there are slight differences. Radio deals with sounds or audio. While television integrate the two, that is both audio and visuals. Traced back antecedent, it is quite glaring that radio have been instrumental for the struggle of Nigeria independence and actualization of democracy. The history of broadcast media radio in Nigeria has been very successful. Radio has contributed greatly for national development and the sustenance of Nigerian democracy. Below are functions of radio and instances where radio has contributed immensely for the sustenance of Nigerian democracy.

- ❖ **Informative:** Generally, broadcast media perform intrinsic role of bringing to the fore, issues of public interest. Radio being an apparatus of broadcast media, its essential role to the society in general is enormous. There are numerous radio stations in Nigeria, some of which are owned by private individuals, while others belong to the government. Public stations are said to be comprehensive in their reportage, while private focus more on commercials. Though the two complement each other. Nineteenth years of Nigerian unbroken democracy is enhanced by the contributory role of radio. It is believed that, radio reaches all the nooks and crannies of the society. Those who lives in rural areas have access to radio because of its reachability. For example, Radio Nigeria (FRCN) is the largest radio network in Africa with about 25 sub stations across the country that hook up daily from the headquarters for network news to keep the people informed on political trends and other vital issues in the society.
- ❖ **Educating:** Radio play a special duty of educating the public on political trends. It is presumed that most citizenry does not know how to vote, the essence of participating in politics to vote a candidate that have the interest of the people at heart. Some leaders are very corrupt, while some lack credible leadership attributes. Such people most times are not allowed to go back for the second term. It is the radio and other mass media platforms that inform the public about all these ills. They educate them on the need to actively participate in politics, they also fight for the interest of the masses so that, they will not be disenfranchised, and give the electorates voters education.

- ❖ **Mobilizing:** This function of radio is very key and instrumental for the sustainability of Nigerian democracy. Before now, many citizens of Nigeria were less-concerned in political participation. People held awkward myths about participating in politics. The situation was just no man's business. But in recent times, the story is quite different. Following the political mantra in 2015 general elections which brought the leadership of Peoples Progressives Congress (APC). It was the mobilizing role of the media that made people to turn out and participate actively for a change of government. Nigerians were tired of the People's Democratic Party's (PDP) government which ruled for 16 years. Political gladiators also uses radio to reach out to their constituents to mobilize them to vote for them.

- ❖ **Entertaining:** Radio entertain the public in the society. Like they say, all work without play makes jack a dampen boy. There are different entertainment programmes that radio broadcast to the public. For example, one of the entertainment role of the radio is the live broadcast of political campaign during elections. Most times, it is true that not everybody that are there during the campaign. Though one may imagine who radio entertain during political campaigns? Remember that, during electioneering campaign, political actors usually use musicians to pass campaign messages in audio or live performing format which radio transmits live to diverse audiences.

- ❖ **Pacesetter:** Radio is tagged as a pacesetter of the society. Broadcast media radio is viewed as the agenda setting platform. They set agenda and others follows. The pacesetter function of radio is found in their daily reportage of events, news programmes, documentaries, news commentary, drama, etc. Across all levels of the society, they cover events to inform the public on recent happenings, including political trends. There were national issues that government did not give concern or attention but because of the magnitude at which radio hammered campaigns on the issue, necessitated government concern. One of which was the issue of NOT TOO YOUNG TO RUN BILL after concerted efforts made by the agitators of this bill through the aid of the media, it was assented to by the President and eventually passed into law.

The Conundrum of Vote Buying and Selling in Nigeria

Ovwasa (2013,p.2) averred that "democracy which is adjudged to be the best form of government all over the world is also being constantly assaulted in Nigeria due to the phenomenon of money politics and vote buying". Although, Nigeria enthroned democratic governance in the fourth republic on May 29th, 1999, the dividends of democracy to the people are very scant and far apart. This is because the concept and practice of democracy appears to be at variance in Nigeria. Actually money and vote buying have vitiated the good qualities of democracy in the country. In fact, the destructive power of money politics has been fingered as one of the factors that undermine good governance in Nigeria.

The role that money and vote buying play in Nigeria politics today have earned them a dominant position in the election of officers into position of authority where they can authoritatively decide who gets what, when and how. Money seems to have taken the center stage in the political process in most countries and in Nigerian politics, it is, sadly, now playing an increasing critical role to such an extent that the word, 'money politics' with a pejorative connotation, have crept into the country's political lexicon", (Davies: 2006:5). The problem with this situation is that the electoral process is often compromised resulting in elections not being free and fair.

Mahmood (2018) posited that brazen act of vote-buying was reported during the recently held governorship election in Ekiti State. As that wouldn't be the first time such incident was reported during an election, political analysts assert that the phenomenon can hurt the country's democracy in the long run , writes JESUSEGUN ALAGBE. A former Prime Minister of Albania, a republic on the Southeastern Europe's Balkan Peninsula , Mr. Fatos Nano , once said , " Organising free and fair elections is more important than the result itself . "However, the result seems to be the main priority of political parties and politicians in some countries, including Nigeria, where the Independent National Electoral Commission is the body vested with the powers to conduct elections.

Elections are said to be a central feature of democracy and for them to express the will of the electorate , they must be free and fair , according to scholars .Democracy proponents believe that if an election is “ free , ” it means that all those entitled to vote are rightly registered and are totally free to make their choice of candidate without imposition or inducement .Perhaps this cannot be said of elections in the country, where the inducement of voters by parties and politicians have somewhat become the order of the day .In the past, there were more cases of snatching of ballot boxes and other forms of violence by politicians wanting to win elections by all means, but recently , the country has seen a wave of vote-buying during elections .

According to an Associate Professor of Political Science at the Massachusetts Institute of Technology, the United States, Frederic Schaffer, vote- buying is giving reward to a person for voting in a particular way. In his piece, Poverty, Democracy , and Clientelism : The Political Economy of Vote Buying , Schaffer noted that vote- buying, in its literal sense, is a simple economic exchange, wherein voters sell their votes to candidates, sometimes to the highest bidder in an election .

According to the Electoral Act , 2010, Article 130, “ A person who – (a) corruptly by himself or by any other person at any time after the date of an election has been announced , directly or indirectly gives or provides or pays money to or for any person for the purpose of corruptly influencing that person or any other person to vote or refrain from voting at such election , or on account of such person or any other person having voted or refrained from voting at such election ; or (b) being a voter, corruptly accepts or takes money or any other inducement during any of the period stated in paragraph (a) of this section , commits an offence and is liable on conviction to a fine of N 100, 000 or 12 months imprisonment or both.

But in spite of the commission’s stance on vote- buying, the act has gradually been turning into a regular phenomenon, as reported during the recently held governorship election in Ekiti State .During the election, anxiety had set in when allegations of vote- buying were levelled against party agents by voters in some polling units. Several video recordings had emerged, showing brazen sharing of cash among the electorate by politicians and parties .It was reported that in some cases, the situation led to friction among supporters of various political parties.

Voters had accused parties of offering up to N5,000 to those who had Permanent Voter Cards to secure their votes. “I was offered N5,000 to vote by one of the parties, but I rejected it. I am a 73 -year -old retired teacher. I cannot allow the future of my children to be bought by moneybags,” a voter had said .In some areas of the state such as Ayegbaju and Oye - Ekiti, it was alleged that party agents paid those who had no PVC N 2,000 to vote in connivance with some INEC officials. It was reported that parties involved in the act started distributing cash inside envelopes from house to house on Thursday night up till Friday morning. “We were already asleep on Thursday night when they came and knocked on our gate and handed envelopes to three persons whose names were on their lists. “ Those who were given envelopes opened them and discovered that there was N4,000 inside each envelope,”.

Hakeem, Suzanne and Ufo (2015, p.1) affirmed that "in Nigeria, political parties budget to bribe security and INEC officials". This is a very serious challenge to our democracy. The above remark was made by Attahiru Jega, the then chairman of Nigeria's electoral body, the Independent National Electoral Commission (INEC), to lament the sorry state of elections in that country. This statement corroborates the many narratives of fraud and malpractice in the successive elections held in Nigeria since its return to democracy in 1999. Clearly, a significant part of the problem with Nigeria's electoral process, especially in the light of Jega's statement, has been the prevailing incidence of vote buying (exchange of cash or gifts for votes), which has almost become a norm during elections. Indeed, vote buying in its different dimensions has been a common and recurring feature in the reports of observers in Nigerian elections. The reports are characterized by statements such as: a politician was alleged by voters to have distributed money to people who queued to vote as well as electoral and security officials at a polling station.

A constitutional lawyer and President, Voters Awareness Initiative, Mr. Wale Ogunade, noted that politicians took vote- buying in the Ekiti State governorship election to a higher dimension. He said that while previous acts of vote- buying were done in secret, it was done openly during the Ekiti State governorship election, saying that the rising phenomenon of vote- buying during elections call for deep concern .He said, “Vote- buying is not a new phenomenon in the country. Before now, we have had it in Anambra State, and before Anambra State, we had it in Edo State. “ But before the elections in Edo and Anambra states , it had always been done secretly – like stuffing naira notes inside loaves of bread or giving out food items and clothes –

all with the intentions of wooing voters against their conscience to vote for them.“ But no doubt, the Ekiti election took vote-buying to a higher dimension. It has now opened it up because it was done with reckless abandon.”Describing vote- buying as “democracy on sale”, Ogunade added that the phenomenon could hamper the development of democracy in the country .As Ogunade stated , the phenomenon was also reported as rampant during the November 2016 governorship elections in Ondo State. Rotimi Akeredolu of the APC eventually won the election .During the election , it was alleged that some voters were bribed with between N 3,000 and N 5,000 in some polling units to vote for the candidate of the vote buyer .It was the same scenario in the November 2017 Anambra governorship election when politicians were alleged to have bought the electorate’s votes for an average of N5 ,000 each , depending on the location .It was reported that in the rural communities, votes were sold for N5,000 each while in the urban areas, they were sold for between N 7,000 and N10, 000 each.

When the Edo State governorship election was conducted in September 2016, the Nigerian Civil Society Situation Room, described the exercise as marred by incidents of “inducement and vote -buying. “It said, “There were concerns of widespread inducement and vote-buying in which two of the major contending parties were cited. “ The vote- buying also led to the monitoring of the votes that were cast by officials of the said parties, apparently in a bid to ensure that voters who were paid, voted as agreed .“ This monitoring was aided by the placement of the voting cubicles in a manner that enabled the party agents to monitor the ballots cast, thus violating the principle of secrecy of vote. ”

A policy analyst in Abuja, Mr. Micheal Adetola, said vote -buying was a corrupt election practice which could hamper the growth of democracy in the country. “It’s a threat to the conduct of free and fair elections. The manner in which it is being done these days is alarming. It’s now done openly, without fear,” he noted. “It is a threat to the future of democracy. But then, it shows the level of poverty that is being experienced in this country, to the extent that some people could sell their votes, their future, for as low as N5, 000. ”In an article titled, Cash for Votes: Political Legitimacy in Nigeria, the Senior Programme Officer at the Africa and West Asia Programme , International Institute for Democracy and Electoral Assistance, Gram Matenga, said that vote- buying could drive up the cost of elections for parties and candidates and might prevent credible candidates from running for political office .He said , that it breeds

cynicism among voters, who feel disenfranchised by a corrupt system that fails to adhere to democratic ideals .

Westminster Foundation for Democracy (2018) stated that vote buying is also evident during the candidates' nomination process by political parties. During the All Progressive Congress (APC) presidential primary in Lagos State before the 2015 elections, over 8,000 delegates who participated allegedly made US\$5,000 each from the candidates. Delegates were supposed to have received US\$2,000 each from the Atiku Abubakar group and also US\$3,000 each from the Buhari group. Given that more than 8,000 delegates were reported to have attended the primaries, the competing camps could have spent more than US\$16 million and US\$24 million respectively on vote buying at the primary stage. The 2015 general election followed the pattern of the previous year during the governorship election in Ekiti State, which was won by a candidate (Mr. Ayo Fawose) who was not widely favoured according to opinion polls conducted before the vote. It was a case of the 'highest bidder' emerges the winner.

Chyi-Lu, and Chun-Ping, (2016, p. 593-594) submitted that vote buying represents the exchange of money, gifts, goods or services for a vote. A "vote is literally 'bought' or 'sold' depending on whether one adopts the perspective of the candidate or the voter (Schaffer, 2002, p. 1)". The process of vote buying is accomplished via vote brokers, called the tiau-a-ka (Rigger, 2000). The vote brokers propose money, goods, or services to the voters in return for their vote (Wu and Huang, 2004). During the election movement, the vote brokers supply "large blocks of votes" to their respective candidates (Rigger, 2000, p. 144). Wu and Huang (2004) document a variety of vote buying techniques employed by vote brokers in Taiwan, i.e., utilization of money and gifts, procuring voters' documents, gambling on election outcome, removing loans, election dinners, raising workers' income, and reimbursing voters' tax fees. In addition, the critically important role of vote brokers is to persuade the voters that they "invested their votes profitably (Rigger, 2000, p. 144)".

Vote brokers utilize three approaches to induce individuals to vote or not to vote for a particular candidate: (a) instrumental, (b) normative and (c) coercive compliances (Schaffer, 2002). In what follows, we briefly describe these compliances, as detailed in Schafer (2002). The instrumental compliance suggests that voters alter or do not alter their electoral behaviour in exchange for substantial gifts. Normative compliance indicates that voters change or do not

change their electoral behaviour due to sentiment of obligation or the proposal by the vote broker persuades the voter of the integrity, honesty, and merit of the candidate. In contrast, coercive compliance refers to vote brokers intimidating the voters to modify their electoral behaviour. Hence, voters fear of retaliation if they refuse the offer produced by the vote broker and if they do not vote as intended subsequently to the acceptance of the offer. Coercion compliances generally consist of “crude violence, threats of punishment, or the withdrawal of benefits that clients usually enjoys (Wang and Kurzman, 2007, p. 227)”.

The Implications of vote Buying to Nigerians and 2019 General Elections

Westminster Foundation for Democracy (2018) avouched that in vote buying transactions in Nigeria, voters are usually offered money, commodities such as food or clothing, and jobs. In countries such as Malawi, Zimbabwe and Uganda, cash-for-vote transactions are quite limited and exchange of votes for goods and services are most common. For example, in Malawi, the governments farm input subsidy initiative has widely been observed as susceptible to political manipulation where issuing of coupons for inputs ‘indirectly’ translate to vote buying. The practice rests upon payoffs that are not directly and explicitly tied to reciprocity in the polling booth.

The issue of vote buying has a multiplier effects on the public. Majority of literate and illiterate fellows were susceptible to vote buying in Nigeria. The just concluded Ekiti governorship election recorded massive cases of vote buying. It is assumed that the public are not much aware of the negative implications of selling votes. Moneybags politicians are just after their personal interest and not for the concern of the public. Below are the effects of vote buying or selling to the public and 2019 general elections;

- ❖ **Denying of Dividend of Democracy:** Democracy encourages social justice and inclusiveness. Therefore, it should be protected. The negative effect of selling vote or buying vote is so enormous. Majority of people are naive, they don't know that political gladiators that comes with peanuts and give to them in exchange for votes are doing that to the detriment of the electorates, and for their personal interest. Come to think of it, we

have seen these moneybags politicians in the past. As soon as they gain access to power, they usually turn back at the public. Many of them are not assessable. They go there to make money for their families. Their apex priority is their loved ones. They have no public interest at hearts. Their children school abroad, while others who can't afford weighty sum of tuitions remain in Nigeria to school in our institutions that facilities are obsolesces, dilapidated, below standards and many more negative factors bedeviled our educational system. Democracy comes with bumper benefits, in a democratized milieu, people enjoy certain dividends such as, infrastructural development, scholarship, good access to basic social amenities, robust social services etc. But with the trend of vote buying and selling, these dividends are threatened, and development is drowsy.

- ❖ **Emergence of Wrong Candidate:** One of the greatest things that happens to the people in governance is to elect a credible candidate to represent them. A candidate whose candidature is free from ambivalence, disgruntlement and idiosyncrasies. But if the wrong candidate emerges, the people suffers. The recent misdemeanor of vote buying is a problem to democracy. Selling of votes facilitate the emergence of wrong candidate. We have moneybags politicians who are desperate to bag power by all cost. They are the ones that use money to buy votes. Remember that, you that sells your vote, you are denying yourself certain benefits of democracy, you are selling your right. Every citizen is entitled to all the benefits that government is supposed to make available for its people. Representatives of every constituency are accorded some obligations to bring to their constituents developmental projects. But in most cases, these projects are not carried out because, those fellows that represent them are not the right candidates. It could be that they manoeuvre their ways into the positions they occupy. Reminisce that, vote buying is not a new trend. It has been going on in the past, though it was miniature. It was only going on in the pipelines but not too brazen as it is today.
- ❖ **Stagnation of Development:** Development is one of the intrinsic aspects of human life. Every society crave for development, and cuts across different levels. Nigeria is undergoing development, we are classified among underdeveloped nations in the world. To achieve modernization, we need pragmatic leaders who are proactive and responsive

to human needs. The issue of vote buying is lethargic to development and it is very harmful to our nineteenth years of unbroken democracy. Selling of vote entails that, the social amenities that would have been brought to you, you have sold them. The unaccessible road in the community that would have been fixed or tar, have been sold to greedy politicians who gives four to five thousand naira to vote for them.

❖ **Corruption:** Vote buying is capable of bringing corrupt leaders back to the system. Etika and Ejue (2018,p. 5-6) avouched that corruption is a societal phenomenon that has deprived citizens of most countries their right of social services because, funds meant for public use are usually misappropriated by corrupts leaders or public office holders. Corruption is a cankerworm that has eaten deep into our marrows and it requires concerted efforts to win this fight, because the rate at which these syndrome has spread is alarming and worrisome. Corruption is mostly perceived to be embezzlement of fund or stealing. But corruption goes beyond looting of public funds, it goes far above mere perception of stealing, looting or embezzling. Nepotism, favouritism and the issue of godfather are all classified to be corruption. Most people in high places of authority employ man -know -man clause for one to be given a job. There are situations where people who possessed requisite qualifications to get the job, but because they don't have anyone at the apex, they tend to deny them the opportunity to get the job. Therefore, the recent issue of undisguised or barefaced vote buying will encourage corruption and 2019 elections will be characterized with irregularities and incessant vote buying and selling. This problem needs to be tackled.

❖ **Massive threat to Democracy:** Democracy is government of the people by the people and for the people. The carnage of vote buying is perceived to be a hiccup for the growth of our democracy. Pundits and scholars have pointed out emphatically the multiplier effects of vote buying to Nigerian democracy. If we remember vividly, the military took over power from civilian in Nigeria because of governance impropriety and corruption. It never augured well with us, we cried and craved for democracy because of military assaults, intimidation and undue suppression. Now that we are enjoying democracy and its dividends, why can't we sustain it by refraining from acts that are capable of jeopardizing our nineteenth years of uninterrupted democracy? Why can't we “SHUN OR

SAY NO” to "VOTE BUYING" for the betterment of public interest and Nigeria democracy.

- ❖ **Negative Image:** A befitting image is key for bilateral ties amongst nations. For a nation to attract neighboring counterparts and far distance leaders to create bilateral relations, such country must have a terrific image among the comity of nations. Negative image is attributed to corruption, electoral offences etc. Therefore, Nigerians should shun any act that would depict our country in a bad light.
- ❖ **Poverty:** Experts have ascribed poverty as the root cause of vote buying in Nigerian elections. This act is very inimical to democracy. The rate of poverty in Nigeria is alarming. According to United Nations index of poverty in Nigeria asserted that an average Nigerian feed less than one dollar per day. This validation is true to some extent because, if you take an inventory to ascertain the level of poverty amid Nigerians, you will concur with UN position. Nigeria is blessed with arable land, human and natural resources that if judiciously harnessed, would be competing with developed nations and our economy would be robust than we ever anticipated, the problem is that, corrupt leaders have in the past robbed Nigerians their virility of enjoying a better life. This is the time Nigerians are supposed to choose credible leaders whose concern is to ameliorate poverty by embarking on projects that have direct impacts on the populace. Leaders that will feel the cry of the masses, rather than allowing greedy politicians to lure them in disgruntle act.
- ❖ **Dwindling life Expectancy:** The truth about life is, if you have money, chances are that, you can afford basic necessities of life including good medical services. But if there is no money, you can easily die in the situation that requires emergency. Lack of proper medical attention have made a lot of people to die. Malnutrition and starvation have been a causative factor to the demise of many individuals in Nigeria and across Africa. For example the issue of youths irregular migration in Nigeria was as a results of those seeking for a better life, in which thousands died on their way for scavenging for greener pasture in foreign lands. Those who ordinarily would have enjoyed longer life expectancy have died because of one problem or the other.

- ❖ **Electoral Malpractice:** Electoral malpractice is a grievous offence according to Electoral Act 2010, article 130 which stated that “ A person who – (a) corruptly by himself or by any other person at any time after the date of an election has been announced , directly or indirectly gives or provides or pays money to or for any person for the purpose of corruptly influencing that person or any other person to vote or refrain from voting at such election , or on account of such person or any other person having voted or refrained from voting at such election ; or (b) being a voter, corruptly accepts or takes money or any other inducement during any of the period stated in paragraph (a) of this section , commits an offence and is liable on conviction to a fine of N 100, 000 or 12 months imprisonment or both. The truth is that, the implication of vote buying for 2019 general elections will be enormous. There will be likelihoods of massive malpractices and irregularities. Wrong leaders will emerge as winners of the forthcoming elections because they are going to employ coercive measures and aggressively aggravate vote buying gimmicks to ensure they win.

Theoretical Framework

Agenda Setting Theory

The agenda setting theory was introduced by Maxwell McCombs and Donald Shaw in 1972. It is a theory that state what the public thinks about what is set by the media. The radio plays an integral part in sensitizing the voters on the need to shun vote selling and buying. The amount of time spend on an issue and the information relayed in a news story, along with the story’s position, determines how much a reader or listener knows the amount of importance placed on the issue. The agenda setting theory seeks to describe the ability of the news media to influence the salience of topics on the public agenda. That is, if a news item is covered frequently and prominently, the audience will regard the issue as more important.

Before the term “Agenda Setting” by McComb and Shaw in 1972, Walter Lippmann’s in 1922 in his book titled “Public Opinion” says “the world outside and the picture in our heads”. Lippmann argues that the mass media are the principal connection between events in the world and the images in the minds of the public. Without using the term “agenda setting” Walter Lippmann was writing about what we today call “agenda setting”.According to Folarin (2002, p.

75) Agenda setting implies that the mass media pre-determine what issues are regarded as important at a given time in a given society. It does not ascribe to the media the power to determine what we actually think; but it does ascribe to them the power to determine what we are thinking about.

The underlying fact behind this theory is that, it helps to give priority to events in the society and help people to ponder or reflect on them. If people are exposed to the same media, they will place importance on the same issues. However, this theory can solve the problem because media in stream of study and practice are vital for human development. Studies have established that the communication process in the media are centrifugal force to self-employment practices through which respective communities are able to arrive at their own understanding of issues, consider them important, discuss ideas, innovate, negotiate and engage in public debates at the community as well as the national level which are relevant to this work.

Wilbur Schramm (1962) says, the media have the potent power which could easily propagate ideas of social change which is the basic tenet of the theory when it comes to development. He also noted that the media serve as “magic multipliers” for facilitating development as they will be very active in enhancing development campaigns in terms of Elections, sustaining democracy, selection of credible leaders etc through their emphasis in the news which is directly correlated with the theories.

Therefore, the mass media accord priority to politically, geographically and culturally contiguous in developing countries in their coverage as part of the holistic strategy for less developed societies and which is exactly like setting agenda for the public through their priority to events and supporting government for development, will help to teach, manipulate, sensitize and mobilize people through information dissemination.

Also, since some media practitioners are always used as agent of propaganda in most cases, to report in the interest of the government instead of the public as monetary inducement is always given to kill a negative story and write positive story and as such not performing their watchdog function well. This theory has helped government officials and media practitioners to know that there are to partner with themselves to enlighten the electorates on the need to stop or reduce incidences of votes buying and selling like the case of Ekiti State just concluded

governorship election which recorded massive votes buying and selling. Therefore, priority should be given to electioneering programmes most especially during elections period more than other news stories to take Nigeria out of this conundrum of votes buying and selling.

Conclusion

The picture is very obvious that vote buying is intended to favour political actors to the detriment of the public. Political analyst, experts and social commentators have reacted to the issue of vote buying. The brazenness of vote buying and selling in Ekiti governorship election sparked public concern amongst Nigerians. This act shows that, vote buying has been neglected in the past and now is gradually becoming a normal business where people trade on votes during elections.

Chyi-Lu, and Chun-Ping, (2016) posited that to start, vote buying may generate inefficient and ineffective outcome in an election because voters may not change their electoral behaviour in exchange for substantial gifts. This is because voters would rather express support for their preferred candidate in an election (Hortala-Vallve and Esteve-Volart, 2011). From this preceding, not all voters that are influenced will take their stand without being influenced by the peanut given to them. Most people are chicken little hearted, they are easily hoodwinked. A little attempt made by political actors, affect them.

For our hard earned democracy not to be jeopardized, we must rise up and say no to vote buying. This may sound so obscure to many fellows. But the truth is glaring and efforts must be put in place to condemn this wrong act. Democracy is the best form of governance, as such we need to protect it by saying no to vote buying. We need to strengthen our electoral institutions to ensure sanity and sanctity of democracy.

Recommendations:

- ❖ Electoral laws should be strengthened to give it a solid backings so as to gain its efficiency in order to deal with electoral offenders appropriately.
- ❖ Mass media should consistently campaign against vote buying in Nigeria until the menace is curbed.

- ❖ Civil society, organizations, activist, political analyst, societal elites, chiefs and elder statesmen should as a matter of urgency, answer their clarion call by organizing workshops, campaigns, or symposium to educate the public on the dangers of vote buying and vote selling during elections.
- ❖ INEC have at one time or the other stated that, they have no power to investigate and arrest violators of electoral offenders. This statement does not mean well to tackle the issue of vote buying. Therefore, government should assign the appropriate agency that prosecutes electoral offenders to work closely with INEC to ensure that whoever faulted the law will not go unprimanded.
- ❖ The electorates should know their worth or value when those involved in vote buying come to them. They should be civil and think of what N5000 will offer them if they sell their votes.
- ❖ Voters should report any form of inducements to the appropriate agencies or authorities to ensure that they are punished, if they do so, it will go a long way to stem the plague.
- ❖ Vote buying and selling involve two parties and above, the first party is the candidate, that is the buyer who is seeking for the vote, and the second party is the voter who sells his/her vote. And the other sub contributors or facilitators are the security agents and the INEC officials who are usually present in the polling booths. Therefore, they should all desist from this act, anyone found guilty should not be spared.
- ❖ Certainly vote- buying does not happen unless some INEC officials and security agents give consent or compromised the process. INEC should arrest those involved to cushion this conundrum.

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Variation of Annual and Seasonal Rainfall Patterns in Kandy District of Sri Lanka

U.S. Meegahakotuwa* and K.W.G. Rekha Nianthi**

*Kandy/Mulgama Maha Vidyalaya, Gampola Education Zone, Central Province, Sri Lanka
**Department of Geography, University of Peradeniya, Peradeniya, Sri Lanka

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Abstract- Rainfall variability over space and time must be regarded as the most significant aspect of the monsoon climate over Sri Lanka. The main objective of this study was to identify the spatial distribution of annual and seasonal rainfall in Kandy District (2005-2014) and long term annual and seasonal rainfall trends in Kandy (1875-2014). The monthly rainfall data have been collected from 19 rainfall stations in Kandy District. The data was obtained from the Department of Meteorology and other relevant institutions. Spatial interpolation was applied to prepare the isohyet maps for Kandy District using Radial Basis Functions Method in ArcGIS 10.4. The rainfall trends over the 140-years period were estimated using the Linear Regression model. The Mann-Kendall statistical method was used to identify the significant or non-significant monotonic tendencies. According to the analysis the highest annual average rainfall (5,660 mm) has been recorded at Galamuduna Estate in Dolosbage, and the lowest is recorded at Kundasale (1,594 mm) during the study period from 2005 to 2014. According to the seasonal rainfall, during the FIM period (March-April) the rainfall varies from 700 mm (Craighead Estate) to 241 mm (Minipe). Rainfall during SWM period (May to September) varied from 3,436 mm at Galamuduna to 174 mm at Minipe. The Southwestern windward side received the highest rainfall while the Eastern leeward side received the lowest rainfall during SWM season. The Galamuduna Estate (1053 m) is situated in highest rainfall region of Wet Zone Up-Country of Sri Lanka. The SIM period (October to November) showed most evenly distributed rainfall over the Kandy District. During the NEM period (December-February), the highest rainfall was recorded in the Eastern side of the Kandy District. The highest rainfall (700 mm–1,000 mm) is recorded in and around Minipe station during this season. Kandy Plateau area received a lower rainfall in the NEM season. The study revealed that the annual and seasonal distribution of rainfall over Kandy District has considerable variations. Based on the annual average rainfall, the wettest place of the Kandy District was the Galamuduna Estate and the driest places were the Kundasale and Minipe. The month of June was recorded as the wettest month (777 mm) in Galamuduna and the same month, Minipe (5 mm) was observed as the driest month during the study period. The complex topographical features and orographic barriers highly affected for the seasonal rainfall variations in the Kandy District. According to long term rainfall data series (1875-2014), the results clearly show that there is a statistically significant decrease in annual rainfall (2.6 mm/year) in Kandy station. The FIM, SIM and NEM seasons do not show a

significant rainfall trend, but the SWM season rainfall shows a statistically significant decreasing trend. The drop in the SWM season rainfall is 2.4 mm per year.

Index Terms - Leeward side, Rainfall, Trend, Variation, Windward side.

I. INTRODUCTION

The Kandy District is situated in the Central Highland of Sri Lanka. It extends in latitude from $6^{\circ} 26'$ to $7^{\circ} 29'$ North and from $80^{\circ} 26'$ to $80^{\circ} 59'$ East longitudes. The District is bounded North by Ukuwela, Rattota, Laggala, Pallegama and Wilgamuwa Divisional Secretary Divisions (DSD) of Matale District, East by Mahiyangana DSD of Badulla District and Walapane, Hanguranketha, Kothmale, Nuwaraeliya and Ambagamuwa Korale DSDs of Nuwaraeliya District and West by Aranayake, Bulathkohupitiya, Mawanella and Rambukkana DSDs of Kegalle District and Mawathagama and Rideegama DSDs of Kurunegala District. Kandy District has an area of 1,940 square kilometers.

The Kandy District has extended from 100 m to 1600 m in height from the sea level. Its Eastern side is bounded to Mahaweli River. The annual average rainfall is 1840 mm for the Kandy District. The Minipe DSD in the Eastern region of the District is consisting with mountains features and Low-Country Dry Zone landscapes. The average temperature of the areas of; Delthota, Pasbage Korale, Ganga Ihala Korale, Udadumbara and Panwila shows a low temperature than other areas of the District but the Minipe shows a higher temperature.

The Mahaweli River is the main river which flows across the Kandy District and it covers 110 km (total of 335 km) within Kandy District. In addition to that, the stream of water of Deduru-Oya begins in the Poojapitiya DSD and Ma-Oya begins in the Ganga Ihala Korale DSD. The Southern part of Knuckles mountain range situated in Kandy District is a unique ecological zone. This zone is the main catchment area of Mahaweli and Aban Ganga. Hantana, Ambuluwawa, Balana range, Alagalla, Hunnagiriya and Dolosbage mountains are located in Kandy District. The waterfalls like; Asupini Ella, Galaboda Ella, and Kadiyanhela are also situated in the Kandy district.

Out of total land of the Kandy District, 41,521 hectare (21%) is covered with forest. A large number of the animal community live in the forest belongs to the District. Among them Elephant,

Leopard Monkey, Wild Boar, Kola Diviya, Deer, Barking Deer are prominent. Wild elephants can be seen in the areas such as Udadumbara, Minipe, Randenigala sanctuary and Meemure.

Rainfall of Sri Lanka is of multiple origins, including monsoonal, convectional and depression activities. In the rainfall calendar of Sri Lanka, there are four distinctive periods have been recognized. They are,

- i. First Inter Monsoon (FIM): March to April
- ii. South West Monsoon (SWM): May to September
- iii. Second Inter Monsoon (SIM): October to November
- iv. North East Monsoon (NEM): December to February

Variability of rainfall over space and time must be regarded as the most significant aspect of the monsoon climate over Sri Lanka. The Central Highland contains many complex topographical features such as valleys, plains, ridges, peaks, plateaus, basin and escarpments. These topographical features strongly affect the spatial patterns of winds, seasonal rainfall, temperature, relative humidity and other climatic elements, particularly during the monsoon seasons.

The Central Highlands is an important catchment area for the river systems of Sri Lanka. Hence, the rainfall changes of the Central Hills of Sri Lanka have been studied widely. Madduma Bandara and Kurupparachchi (1988) found that the annual precipitation at Nuwaraeliya in the Central Highlands has decreased during the last century where land use has undergone significant changes. For example, between 1956 and 1981, area under tea and forests decreased from 61% to 39% and from 17% to 15%, respectively. On the other hand, the homestead and croplands increased from 7% to 17% and from 7% to 15%, respectively. Kayane et al. (1995) have shown that rainfall during the SWM Season has decreased in the Central Highland since the 1870's. They also suggested that a significant decline in rainfall in the plateau could be related to global warming and the rise of the Sea Surface Temperatures (SST) in the surrounding Indian Ocean. Further, they have pointed out that the increased SST over the Indian Ocean will intensify the Indian Monsoon circulations, which in turn may increase the coastal windward rainfall with a comparative decrease of rainfall in the leeward areas of Sri Lanka.

Rekha and Punyawardena (2003) have found that negative anomalies of rainfall are evident in the western slopes of the Central Highland where SWM is the dominant rainfall governing mechanism. The analyses clearly show that increased variability is the most dominant feature of the rainfall regime in the Central Highlands during recent time than that of any other trend. Madduma Bandara and Wickramagamage (2004) have found a significant decrease in annual rainfall in the upper watershed areas, over the last 100 years, reflecting at least a 20% decline at Nuwaraeliya and west facing slopes. They have pointed out that the primary reason for the decline in annual rainfall appears to be the failure of the SWM that brings the largest share of total rainfall to the western parts of the Central Hills.

Malmgren et al. (2003) used monthly average rainfall data of 130 years, between 1870 and 2000 to examine the rainfall patterns.

They concluded that some stations in Central Highlands demonstrate a decrease in the SWM, but no statistically significant upward or downward trend exists for the NEM. During the FIM and SIM the only statistically significant trend in the Central Highlands was the decreasing trend observed in Nuwaraeliya.

Wickramagamage (2015) examined the daily rainfall variations for the period from 1981 to 2010. Out of 48 stations, 39 displayed negative trends during SWM period. The strongest negative trends are found in the Central Highlands and surrounding areas. SWM is the dominant rainfall season in the Southwestern lowlands as well as the Highland Wet Zone of Sri Lanka. It is clearly shown that almost the entire island experiences a reduction of rainfall during SWM. This decrease is negatively influenced to the irrigation and agriculture, domestic water supply, industrial water supply and power generation in the country.

II. MATERIALS AND METHODS

The main objectives of this study are to examine; (i) the spatial and temporal variations of annual and seasonal rainfall patterns in Kandy District, (ii) the long term annual and seasonal rainfall trends of Kandy station. The monthly rainfall data have been collected from 19 rainfall stations (Figure 1 and Table 1) in Kandy District for the period from 2005 to 2014. The data was obtained from the relevant institutions like:

- i. Department of Meteorology, Colombo.
- ii. Natural Resource Management Centre (NRMCC).
- iii. Mid Country Tea Research Institute, Hantana.
- iv. Peradeniya Botanical Garden.
- v. Tea Estate Offices in the Kandy District.

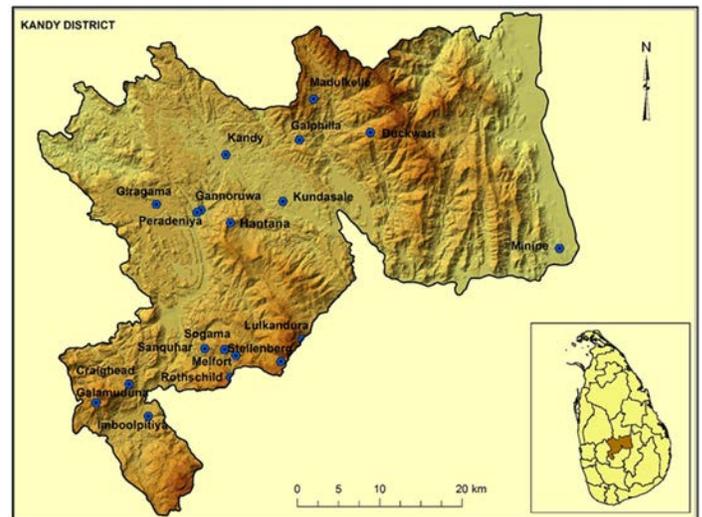


Figure 1: Geographical Distribution of the Rain Gauge Stations in the Kandy District.

Spatial interpolation technique was applied to prepare the isohyet maps of rainfall for Kandy District using Radial Basis Functions Method in ArcGIS 10.4. To identify long-term trends in the rainfall of Kandy, the monthly rainfall has been obtained from the Katugastota (Kandy) Meteorological station from 1875 to 2014. The rainfall trends over the 140-years period were

estimated using the Linear Regression model. The Mann-Kendall statistical test was used to distinguish significant and non-significant monotonic trends.

Table 1: Geographical Distribution of the Rain Gauge Stations in the Kandy District.

Rainfall Station	Latitude (North)	Longitudes (East)	Elevation (m)
1. Kandy	7 ⁰ 20'	80 ⁰ 38'	477
2. Gannoruwa	7 ⁰ 16'	80 ⁰ 36'	479
3. Kundasale	7 ⁰ 16'	80 ⁰ 41'	492
4. Hantana	7 ⁰ 16'	80 ⁰ 38'	762
5. Peradeniya	7 ⁰ 16'	80 ⁰ 35'	472
6. Giragama	7 ⁰ 16'	80 ⁰ 32'	523
7. Galphilla	7 ⁰ 21'	80 ⁰ 42'	710
8. Madolkele	7 ⁰ 23'	80 ⁰ 43'	1095
9. Stellenberg	7 ⁰ 06'	80 ⁰ 41'	1260
10. Sanquhar	7 ⁰ 07'	80 ⁰ 36'	853
11. Sogama	7 ⁰ 07'	80 ⁰ 37'	1067
12. Melfort	7 ⁰ 06'	80 ⁰ 38'	975
13. Rothschild	7 ⁰ 05'	80 ⁰ 38'	972
14. Imboolpitiya	7 ⁰ 02'	80 ⁰ 32'	600
15. Galamuduna	7 ⁰ 03'	80 ⁰ 29'	1053
16. Craighead	7 ⁰ 04'	80 ⁰ 31'	900
17. Lulkandura	7 ⁰ 07'	80 ⁰ 42'	1082
18. Duckwari	7 ⁰ 21'	80 ⁰ 47'	1105
19. Minipe	7 ⁰ 12'	80 ⁰ 58'	113

III. RESULTS AND DISCUSSION

A. Variation of Annual Rainfall

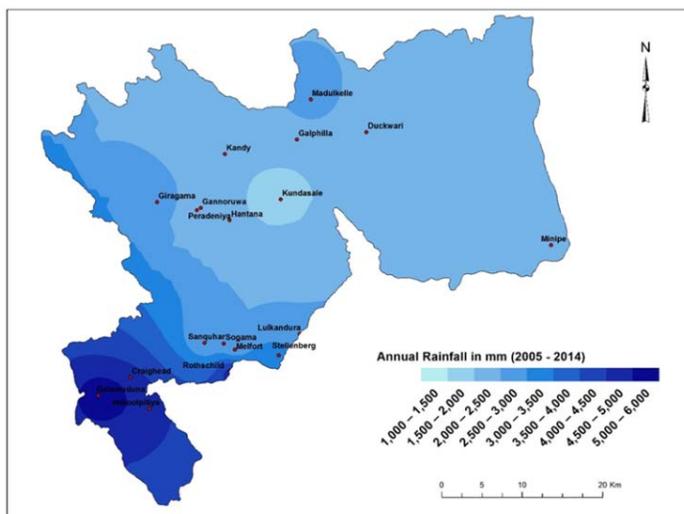


Figure 2: Variations of Mean Annual Rainfall in Kandy District

The mean annual rainfall varies from 2000 mm in the driest parts (Eastern part of the District) to over 5000 mm in the wettest parts

(Southwestern slope of the District) (Figure 2). The highest annual average rainfall (5,660 mm) has recorded at Galamuduna Estate (Dolosbage), and the lowest is recorded at Kundasale (1,594 mm) during the study period. From 2001 to 2014 the Galamuduna annual average rainfall was 5,176 mm.

B. Variations of Seasonal Rainfall

March to April belongs to the FIM period and during this time convective rains are occurred overland especially in the afternoon and convergence activity in the ITCZ (Inter Tropical Convergence Zone) plays a major role. During this time, evening occur thundershowers too. ITCZ is migrating over Sri Lanka this time. The FIM rainfall variation in Kandy District is shown in figure 3. The distribution of rainfall during this period, the rainfall varies from 700 mm (Craighead Estate) to 241 mm (Minipe).

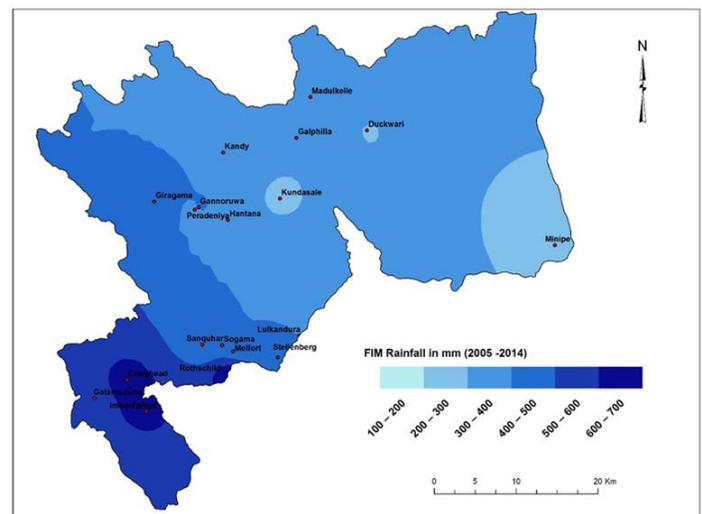


Figure 3: Variations of Rainfall during FIM Season in the Kandy District

SWM period occurs during May to September when depressions, and cyclonic wind circulations activate in the low and mid troposphere of the atmosphere. Orography also controls the rainfall distribution in Sri Lanka during this period. When winds originate in the South-west side of Sri Lanka, it brings a large amount of moisture from the Indian Ocean. Equatorial westerlies are also activated during this time. When these winds encounter slopes of the Central Highlands, they transport heavy rains on to the mountain slopes and the Southwestern sector of the island. But the leeward slope in the East and North East receive little rain during this period. During this season the ITCZ move gradually northward. The Kandy District rainfall during SWM period varied from 3,436 mm at Galamuduna to 174 mm at Minipe (Figure 4). The Southwestern windward side of the Central Highland received the highest rainfall while the Eastern leeward side received the lowest rain during SWM season. The Galamuduna Estate is situated in highest rainfall region of Wet Zone Up-Country of Sri Lanka. Out of 4 rainfall seasons, the spatial variation is high in Kandy District mostly during SWM period.

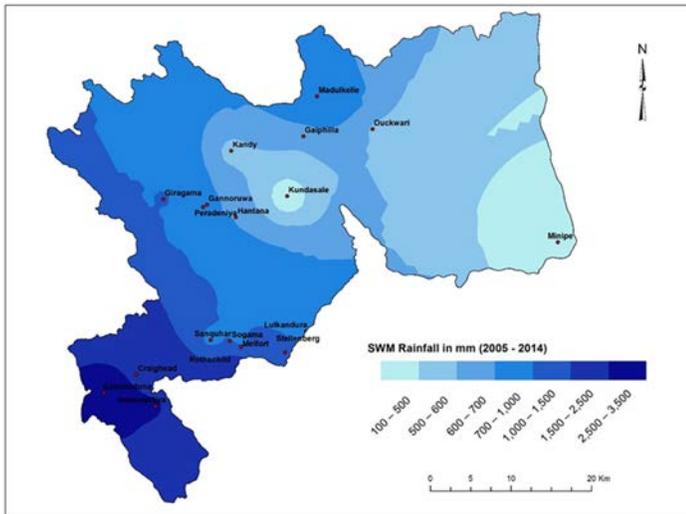


Figure 4: Variations of Rainfall during SWM Season in the Kandy District

SIM period occurs during October to November: convection, cyclonic wind circulation, and convergence activity make the rainfall widespread due to ITCZ migrating over Sri Lanka during this period. The tropical depression has the highest frequency during this time. The SIM period is the period with the most evenly distribution of rainfall over Sri Lanka and this characteristic clearly shows in the Kandy District (Figure 5). Almost the entire District receives in excess of 500 mm of rain during this season, with the Southwestern slopes receiving higher rainfall in the range of 1000 mm to 1500 mm.

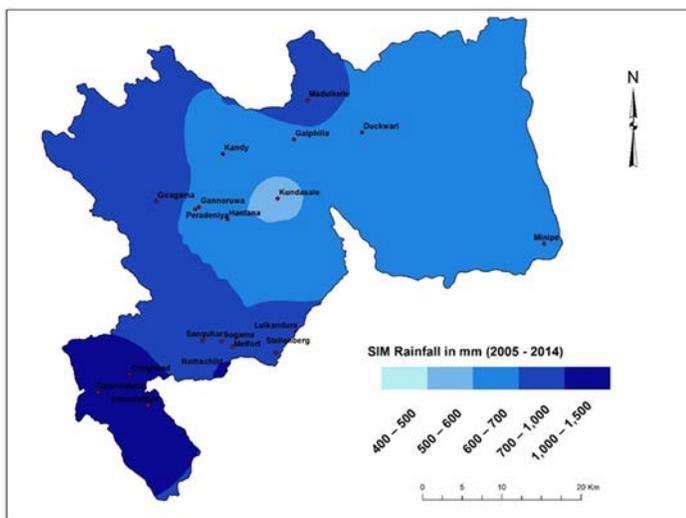


Figure 5: Variations of Rainfall during SIM Season in the Kandy District

NEM occurs in December to February. Monsoon winds come from the North Eastern side, bringing moisture from the Bay of Bengal. During the NEM period, the highest rainfall amounts are recorded in the Northeastern slopes of the Central Hills. This season is characterized by the ITCZ positioning itself South of Sri Lanka. The highest rainfall was recorded in the Eastern side of the Kandy District during NEM period (Figure 6). The highest rainfall (700 mm–1,000 mm) is recorded in and around Minipe

station during this season. Kandy Plateau area received a lower rainfall in the NEM season.

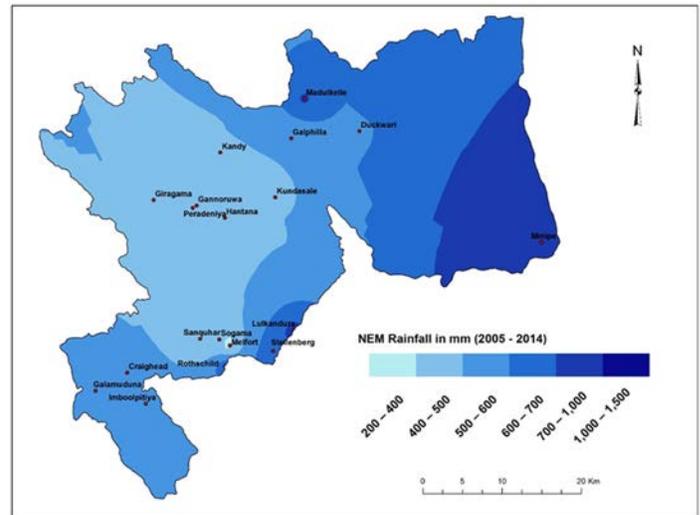


Figure 6: Variations Rainfall during NEM Season in the Kandy District

Based on the annual average rainfall, the wettest place of the Kandy District was the Galamuduna Estate and the driest places were the Kundasale and Minipe. The month of June was recorded as the wettest month (777 mm) in Galamuduna and the same month, Minipe (5 mm) was recorded as the driest during the study period. Total monthly average rainfall in Galamuduna and Minipe shows in figure 7.

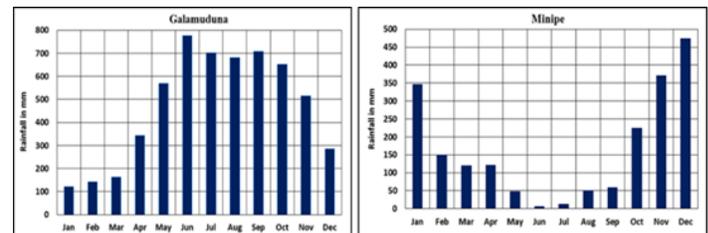


Figure 7: Monthly Average Rainfall at Galamuduna and Minipe

C. Orographic Effect and Variation of Monsoons Rainfall in Kandy District

Yoshino et al (1983) pointed out that the location of the Central Highland is one of the main physical structures which control the climate of Sri Lanka. Horizontal and vertical structures of the physical setting of the Sri Lanka topography create large diversity to change the rainfall distribution. The Western side of the Central Highland receives more rainfall than Eastern side and especially when SWM rainfall activates. Similarly, when NEM activate the rainfall is higher on the Eastern side but compare to SWM, NEM give less rainfall. Orographic effect of the Central Highlands of Sri Lanka has similar patterns with the global figures of the orographic rainfall in the tropical mountains and highlands (Rekha, 2005).

It is well known that the high amount of rainfall receive on the Western side of Sri Lanka and is induced by the topographic

barriers known as the Western slopes of the Central Highland. The relief of Sri Lanka characterized by the Central Highland is one of the major factors governing the climate of Sri Lanka. Considerable spatial differentiation of the climate is to be expected in the SWM as well as in the NEM season, as results of the effects of the Central Highlands, which form an orographic barrier across the path of the monsoonal air masses and winds. Thus, not only the highlands take on the role of a climatic shed, but at the same time, there is also established the regional differentiation of the highlands into a windward side and a leeward side, including the flanking lowlands. Due to opposing wind direction of the SWM and NEM, the windward and leeward sides of the highlands keep changing their role according to the rhythm of the monsoon change: those parts of the highlands on the windward side during the other monsoon seasons and vice versa. The windward and leeward side effect of the Central Highlands on the monsoonal air masses may exercise the greatest effects on rainfall and wind, as also on the other climatic elements though to a lesser degree.

The topographical barriers highly affected in the rainfall distribution patterns of Kandy District specially SWM and NEM seasons (Figure 8 and 9). Figure 8 shows geographical location and monthly average rainfall in Stellenberg and Lulkandura stations. According to direct distance, these two stations are situated by close distances. But barriers of North part of Piduruthalagala mountain range situated between this two stations. Therefore Stellenberg was located in the Western slope of the Central Highland (windward side of SWM season and leeward side of NEM season) and Lulkandura was located in the Eastern slope of the Central Highland (windward side of NEM season and leeward side of SWM season). The Stellenberg station has received in excess of 175 mm of rain during every month of SWM season (May to September). Month of July has received in excess of 250 mm of rainfall. But Lulkandura station has received fewer of 160 mm of rain during every month of SWM season. The month of August was recorded as the driest (123 mm) month in Lulkandura. In this situation, the opposite case is true during NEM period. The Lulkandura station has received in excess of rainfall during NEM season (December to February) and month of December was recorded as the wettest (356 mm) month in this station. But the month of February was recorded as the driest month in Stellenberg.

Figure 9 shows geographical location and monthly average rainfall in Galamuduna and Craighead stations. These two stations are situated in the Western slope of Central Highland and windward side of SWM season and leeward side of NEM season. Monthly rainfall distribution shows high rainfall during SWM period from May to September in Galamuduna and Craighead. NEM period Galamuduna and Craighead stations have received low rainfall because these two stations situated in the leeward side of Central Highland and located by close distance. But every month belongs to the SWM season have received high rainfall amount to Galamuduna than Craighead, i.e. from 2005 to 2014 the Galamuduna month of June rainfall was 700 mm and the same month Craighead rainfall was 531 mm. The main reason for this micro-scale rainfall variation is the barriers of Kabaragala mountain range situated between Galamuduna and

Craighead stations. According to this rainfall pattern, the complex topographical features and orographic barriers are highly affected for the seasonal rainfall variations of Kandy District.

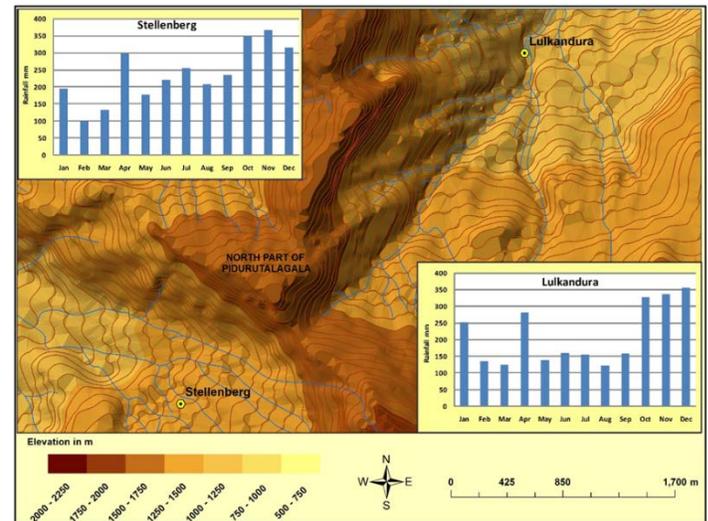


Figure 8: Geographical Location and Monthly Average Rainfall in Stellenberg and Lulkandura

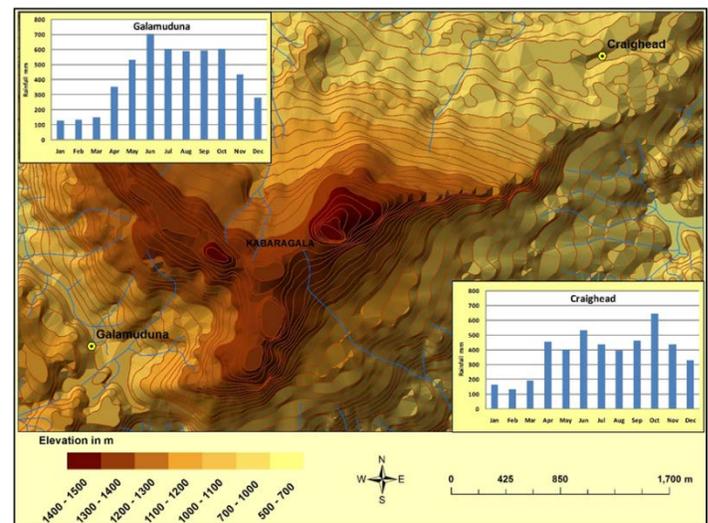


Figure 9: Geographical Location and Monthly Average Rainfall in Galamuduna and Craighead

D. Long term rainfall trends in Kandy station

The annual average rainfall (1875-2014) is 2026 mm in Kandy station. Figure 10 shows that the monthly distribution pattern of rainfall in Kandy station. The highest rainfall amount has received in the month of October and lowest rainfall amount has received in the month of February. Out of total amount of annual rainfall (2026 mm), 288 mm (14%) has received in FIM season, 771 mm (38%) has received in SWM season, 562 mm (28%) has received in SIM season and 401 mm (20%) has received in NEM season during 1875 to 2014.

The annual average rainfall has decreased by an amount of 243 mm (about 11%) during 1945 to 2014 period compared to 1875

to 1944 period. FIM rainfall has been decreased by an amount of 8 mm (about 3%), SWM rainfall has been decreased by an amount of 218 mm (about 25%) and NEM rainfall has been decreased by an amount of 28 mm (about 7%) during 1945 to 2014 period compared to 1875 to 1944 period. Only SIM rainfall has been increased by an amount of 9 mm (about 2%) during 1945-2014 period compared to 1875-1944 period (Figure 11).

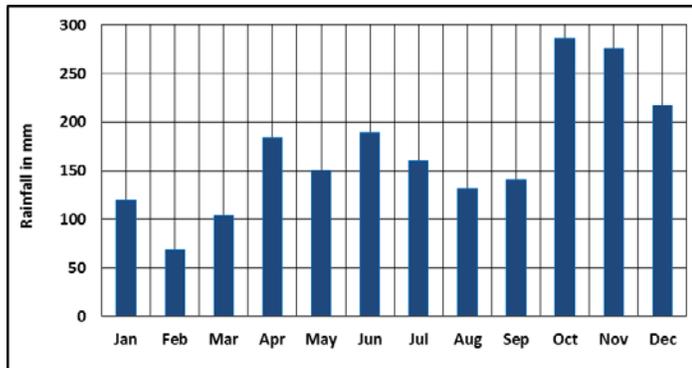


Figure 10: Annual Average Rainfall in Kandy Station (1875-2014)

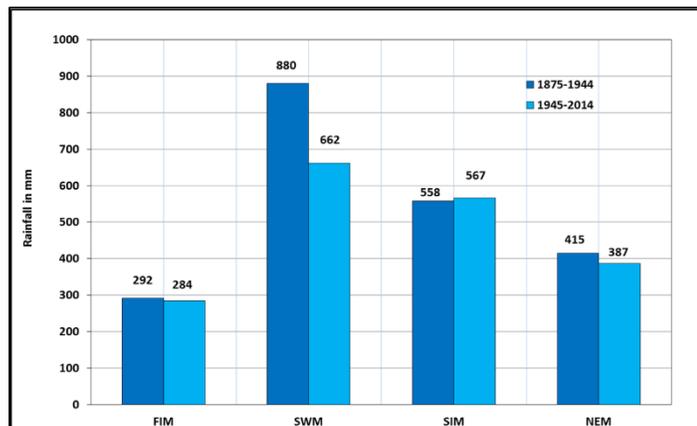


Figure 11: Seasonal Average Rainfall in Kandy station (1875-1944 and 1945-2014)

An annual total rainfall time series analysis from 1875 to 2014 was done for the Kandy station and it shows a significant ($P < 0.05$) decreasing trend. The rate of decrease of annual rainfall was 2.6 mm per year for the period 1875-2014 in Kandy station (Figure 12).

Figure 13 shows the FIM, SWM, SIM and NEM seasonal rainfall totals. All the seasons demonstrate significant year-to-year variations. However, trend analyses of the rainfall amounts in the FIM, SIM and NEM seasons do not show a monotonic decreasing or increasing trend at the 95% confidence level according to the Mann-Kendall statistical test. In contrast, the SWM rainfall amount demonstrates a decreasing trend at the same level of confidence. The negative slope of the equation of the linear regression line shows a 2.6 mm drop in the SWM. Even the application of robust regression to minimize the influence of outliers produced a 2.4 mm decrease in SWM rainfall per year.

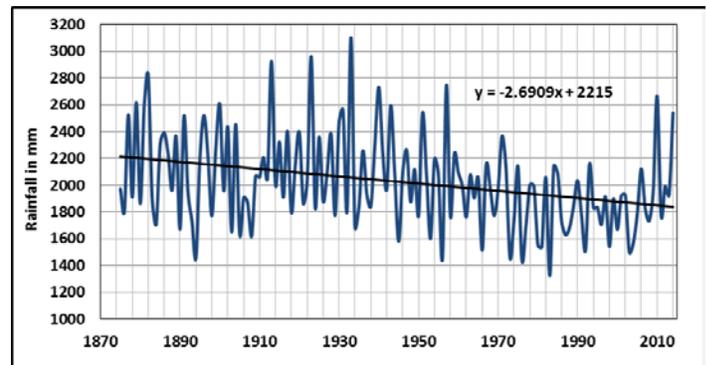


Figure 12: Annual Rainfall Trends in Kandy station (1875-2014)

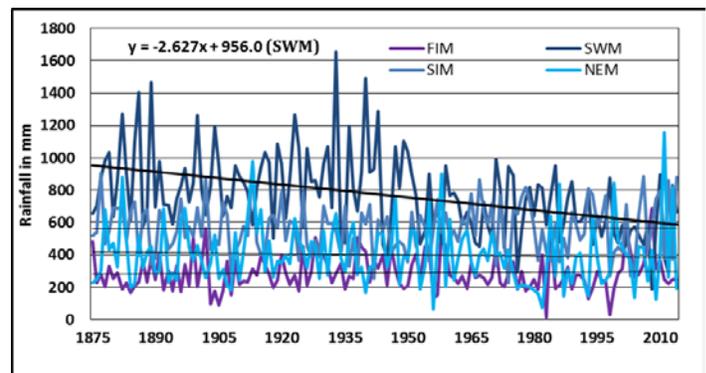


Figure 13. Trends of Seasonal Rainfall in Kandy station (1875-2014)

IV. CONCLUSIONS

The mean annual rainfall varies from the driest parts (Eastern part) of the Kandy District to over the wettest parts (Southwestern slope). During FIM period the rainfall varies from western side i.e. Craighead Estate to eastern side i.e. Minipe. The rainfall during SWM period, the Southwestern windward side of the Kandy District received the highest rainfall while the eastern leeward side received the lowest rainfall which varied from i.e. Galamuduna to Minipe. The SIM period most evenly distribution of rainfall over Sri Lanka has been noticed and its characteristic are clearly shows in the Kandy District. During the NEM period, the highest rainfall figures are recorded in the Eastern slopes of the Kandy District. This season is characterized by the ITCZ positioning itself South of Sri Lanka. The highest rainfall is recorded in and around Minipe station and Kandy Plateau area received a lower rainfall in the NEM season. Due to opposing wind direction of the SWM and NEM, the windward and leeward sides of the highlands (including Kandy) keep changing their role according to the rhythm of the monsoon change. The annual average rainfall has been decreased by an amount of 243 mm (about 11%) during 1945 to 2014 period compared to 1875 to 1944 period. SWM rainfall has been decreased by an amount of 218 mm (about 25%) during 1945 to 2014 period compared to 1875 to 1944 period. Only SIM rainfall has been increased by an amount of 9 mm (about 2%) during 1945-2014 period compared to 1875-1944 period. SWM season rainfall shows a statistically significant decreasing trend. The drop in the SWM season rainfall is 2.4 mm per year. The reason for the decrease in rainfall in Kandy station during SWM season cannot be properly

understood without a good knowledge about clouds that produce rainfall over the Central Highlands. A ground-based cloud observation system is not available in Sri Lanka. Such a system must be established in order to study clouds over Sri Lanka.

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AUTHORS

First Author – U.S. Meegahakotuwa, BA (Hons) in Geography, Geography Teacher, Kandy/Mulgama Maha Vidyalaya, Gampola Education Zone, Central Province, Sri Lanka,

udanasaminjaya@gmail.com

Second Author – Dr. K.W.G. Rekha Nianthi, (PhD), Senior Lecturer, Department of Geography, University of Peradeniya, Sri Lanka, rekhanianthi@yahoo.com

Correspondence Author – U.S. Meegahakotuwa, udanasaminjaya@gmail.com, 077 9877024

MOTHERS' SATISFACTION ON MATERNITY CARE SERVICES IN BHARATPUR HOSPITAL CHITWAN, NEPAL

Devi Kumari Sapkota, Mathura Sapkota, Bishnu Kumari Shrestha

Lecturer

Bharatpur Hospital Nursing College

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Abstract

Objective: The objective of the study was to assess the mother's satisfaction on maternity care services in Bharatpur Hospital, Chitwan, Nepal.

Methodology: A hospital based cross sectional analytical study design was used to assess the mothers' satisfaction on maternity care services in public Hospital of Bharatpur Chitwan, Nepal. Four hundreds twenty-five postnatal mothers were selected using non-probability purposive sampling technique as study sample. A Nepali version semi structured questionnaire was used to collect the data on sociodemographic and obstetrics information and three point like rt-scale developed by researcher self was used to collect the data by interview technique regarding mother's satisfaction on maternity care services they get during the hospital stay (after 6 hrs to 24hrs of delivery). Mothers' satisfaction was assessed in five dimensions i.e. interpersonal care, information given, psychological and emotional support, physical birth environment and comfort measures. Ethical approval from Nepal Health Research Council (NHRC) was taken and study carried out. The obtained data was analyzed using descriptive and inferential statistics and presented in different tables.

Results: Among 425 respondents, more than half (55.5%) were 20–25 years old. Nearly half (48.9%) of the respondents were from Janajati, followed by bramin/chhetri about one third (32.5%). More than half (55.8%) of the respondents from outside Chitwan district are taking maternity services in the hospital. More than half (54.6%) respondents were first gravida and majority of Respondents (88.7%) pregnancy status was planned. Waiting time during admission to receive service, in about two third (63.5%) respondents was just 15 minutes. More than half of the respondents (55.5%) are satisfied with maternity services, 40.7% are highly satisfied and least (3.8%) are unsatisfied. Furthermore, satisfaction with the maternity care services was found to have a significant association with the Waiting time during admission to receive the service by the respondents ($p=0.003$) and significant association with reason for choosing service ($p=0.01$). Out of total 63 score of assessment items, the mean score was 52.569(± 8.672).

Conclusion: The study concludes that more than fifty percent respondents were satisfied on maternity care services and only least number of respondents were unsatisfied. They answered that service is satisfactory though there is need to improve the service if respondents to be a highly satisfied.

Key words: Mother' satisfaction, Maternity care services

Introduction

Satisfaction with healthcare services is defined as the extent to which the patients seeking treatment experience positive perception of the care provided by the nursing or medical staff. Ideally, patients who are satisfied with the care provided by the healthcare staff, are more likely to utilize health services in future and comply with the prescribed medical treatment to completion. Providing high quality of care in maternity services involves giving mothers the best possible medical care and outcome during antenatal, delivery, and postnatal period which can be measured against standard guidelines (Okumu & Oyugi, 2018).

Satisfaction is a meaningful output indicator of quality health care. Satisfaction with childbirth experience is important to the woman, infant's health and well-being, and mother-infant relationship. Mother's positive perception of birth experience has been linked to positive feelings toward her infant and adaptation to the mothering role (Mbeinkong, 2010).

Every year about 287,000 women die of causes associated with childbirth, 99 percent in developing countries. Owing to considerable gaps in services, developing countries emphasize on increasing service availability and maintaining acceptable quality standards. Understanding maternal perception of care and satisfaction with services is important in this regard, as perceived quality is a key determinant of service utilization. Users who perceive the quality of care in a health center to be good, are more likely to visit it again, thereby increasing demand for the service. Patient satisfaction is thus indispensable to quality improvement with regard to design and management of health care systems. At a time when global efforts to reduce maternal mortality have been stepped up, it is important to look at maternal satisfaction and its determinants (Srivastava, Avan, Rajbangshi & Bhattacharyya, 2015).

A cross sectional study was conducted by Amdemichael, Tafa & Fekadu(2014) on “Maternal Satisfaction with the Delivery Services” to assess maternal satisfaction with the delivery service on a sample of 398 delivering mothers using convenient sampling technique. Data was collected using structured questionnaire. The findings of the study showed that the overall maternal satisfaction level with the delivery services rendered at the hospital was 80.7%. Dissatisfaction was reported to be highest (42.3%) by cleanliness and access of toilet. Furthermore, satisfaction with the delivery service was found to have a significant association with the age of the respondents 20-34 [AOR=4.65(2.35, 9.20)] and educational level of the respondents [AOR = 2.42, 95%CI: 1.17, 5.00].

A cross sectional study was conducted on south ethopia among women who gave birth at public health facility. Satisfaction level was measured using a 5 point- likert scale questions in 256 women who gave birth. This study revealed that 90.2 % of women who gave birth in public health facilities were satisfied with labour and delivery care (Dewana, 2014).

A quantitative, descriptive, cross-sectional study was undertaken to assess mothers' satisfaction with maternity services at a regional hospital in the Limpopo Province of South Africa, and its 11 referring clinics. Structured interviews were conducted with 79 mothers during their postnatal visits. Many mothers were teenaged, single and unemployed. Overall, 51.9% ($n = 41$) of the interviewed mothers were satisfied; 32.5% ($n = 25$) were neutral; and 16.5% ($n = 13$) were dissatisfied with the care they had received during the intrapartum and early postpartum periods (Lumadi & Buch, 2011).

A study on Maternal satisfaction regarding perinatal care and influencing factors in tertiary hospitals of western, Nepal was performed among 428 postnatal women in which Maternal satisfaction was measured by 25 item scale. Overall 45.1% of mothers were satisfied with the perinatal care. The level of satisfaction in public hospital (mean 3.44 ± 0.65 out of 5) was greater as compared to private hospital (mean 3.27 ± 0.59 out of 5). The satisfaction score was lower in the physical environment (mean 3.01 ± 0.87 out of 5) and highest in privacy maintained (mean 4.37 ± 0.92 out of 5). Determinants of satisfaction were type of hospital, religion, education,

parity, number of living children, mode of delivery, gestational age at birth, maternal condition after delivery, newborn health condition, and duration of stay at the hospital and the gender of the provider ($p < 0.05$) (Regmi, Kaphle & Gupta, 2017).

Finding of the study

The findings of the study on sociodemographic and obstetrics information as well as five dimension of mothers' satisfaction on maternity services are presented in tables.

Table 1

Table1: Socio-Demographic Characteristics of the Respondents (n=425)

Variables	Frequency (n)	Percent (%)
Age in years		
< 19	67	15.8
20-25	236	55.5
26-30	95	22.4
31-35	26	6.1
above 35	1	.2
Mean Age 22.71(± 3.975)		
Ethnicity		
bramin/chhetri	138	32.5
Janajati	208	48.9
Dalit	47	11.1
terai/madhesi	31	7.3
Muslim	1	.2
Religion		
Hindu	373	87.8
Buddhist	37	8.7
Christian	14	3.3
Others(Islam)	1	.2
Educational status		
never attended school	23	5.4
primary level	93	21.9
Secondary	110	25.9
higher secondary and more	199	46.8
Residence		
Chitwan	188	44.2
out of chitwan	237	55.8
Employment status		
work at home	380	89.4
Business	19	4.5
Job	26	6.1

Table 1 reveals that among 425 respondents, more than half (55.5%) were 20–25 years old. The mean age of the respondents was 22.71 (± 3.975) years; the minimum age was 15 years and the maximum age was 37 years. Nearly half (48.9%) of the respondents were from Janajati, followed by bramin/chhetri about one third (32.5%). Most of the respondents religion was hindu(87.8%). Nearly half (46.8%) of the respondents had completed Higher secondary education. More than half (55.8%) of the respondents from outside Chitwan district are taking maternity services in the hospital. Majority of the respondents (89.4%) work at home.

Table 2: Obstetrics Characteristics of the Respondents (n=425)

Variables	Frequency (n)	Percent (%)
Gravida		
First	232	54.6
Second	161	37.9
Third	26	6.1
fourth or more	6	1.4
Pregnancy status		
Planned	377	88.7
Unplanned	48	11.3
Number of children		
One	240	56.5
Two	164	38.6
Three or more	21	4.9
Waiting time on admission to receive service		
15 minutes	270	63.5
30 minutes	58	13.6
1 hour	39	9.2
more than 1 hour	58	13.6
Hours of stay in hospital before delivery		
1-3 hours	100	23.5
4-6 hours	79	18.6
7-9 hours	46	10.8
10 hours and above	200	47.1
Duration of labour		
<12 hours	227	53.4
12 hours	93	21.9
>12 hours	105	24.7
Sex of baby		
Male	196	46.1
Female	229	53.9
Reason for choosing service		
Quality Services	199	46.8
Nearer	158	37.2
Referral from any institution	68	16.0

Table 2 shows that more than half (54.6%) respondents were first gravida and majority of respondents (88.7%) pregnancy status was planned. More than half (56.5%) have one child and least (4.9%) have three or more children. Waiting time during admission to receive service, in about two third (63.5%) respondents is 15 minutes. Near about half respondents (47.1%) stay in hospital ten hours

or more before delivery. More than half respondents (53.4%) have less than 12 hour duration of labor and (53.9%) have female baby. Near about half(46.8%) respondents' reason for taking the delivery service in this hospital is availability of quality services and only16.0% are referral cases from other institutions.

Items of Assessment	Highly Satisfied F (%)	Satisfied F (%)	Unsatisfied F (%)
Privacy maintained during care	121(28.5)	190(44.7)	114(26.8)
Make you feel comfortable before delivery,	30(7.1)	198(46.6)	197(46.4)
Make woman aware about fetus condition	48(11.3)	160(37.6)	217(51.1)
Special care, while conducting delivery by encouraging to push, make clam and comfortable	32(7.5)	162(38.1)	231(54.4)
Politeness, courtesy and respect shown	54(12.7)	23.3(54.8)	138(32.5)
Cleanliness of the ward	39(9.2)	311 (73.2)	75(17.6)
Availability of the beds	104(24.5)	173(40.7)	148(34.8)

Table 3: Frequency of the Respondents according to Satisfaction Score of Maternity Care Services (n=425)

Well Sanitation and infrastructure facilities	55(12.9)	274(64.5)	96(22.6)
Information about ward routine	77(18.1)	246(57.9)	102(24)
Information about woman’s and fetus condition	50(11.8)	174(40.9)	201(47.3)
Make woman aware and take consent before any procedure	71(16.7)	209(49.2)	145(34.1)
Mother got help during labour pain, during any medication	54(12.7)	193(45.4)	178(41.9)
Health personnel were clam, approachable, and available nearer to you	54(12.7)	257(60.5)	114(26.8)
Assist mother in keeping you clean	75(17.6)	175(41.2)	175(41.2)
Listen worries and problem	58(13.6)	219(51.5)	148(34.8)
Providing emotional support and psychological support	24(5.6)	197(46.4)	204(48)
Develop positive attitude in your mind	39(9.2)	242(56.9)	144(33.9)
Make you feel special	54(12.7)	229(53.9)	142(33.4)
Observation during and before any medication	43(10.1)	193(45.4)	189(44.5)
Provide help before delivery and after delivery	36(8.5)	165(38.8)	224(52.7)
Provide information about postnatal care and newborn care	185(43.5)	143(33.6)	97(22.8)

In the study the mothers’ satisfaction was assessed in five dimensions. The first was interpersonal aspects of care which includes the five items: Privacy, making comfortable, aware on fetus condition, special care while conducting delivery and Politeness, courtesy and respect, the mean score was 11.44(±2.256). Likewise the second, physical birth environment includes the three items: cleanliness of the ward, availability of the beds and well sanitation and infrastructure facilities (bathroom, toilet, electricity and water supply), the mean score was 6.277(±1.489). Similarly third was information given by health personnel which includes three items: information about ward routine, information about woman’s and fetus condition and consent before any procedure, the mean score was 6.588(±1.496). Another dimension was comfort Measures provided by health personnel includes three items: getting help during labour pain, clam, approachable behavior and available of Health Personnel and assisting mother in keeping the clothes clean, the mean score was 6.668(±1.616). The last dimension includes the seven items: Listen worries and problem, providing emotional and psychological support, develop positive attitude in your mind, make you feel special, observation frequently, provide help before delivery and after as required and provide information about postnatal care and newborn care and the mean score was 15.668(±3.428). Out of total score 63 of assessment items, the mean score was 52.569(±8.672).

Table 4: Level of Satisfaction on Five Dimension of Maternity Care Services (n=425)

Range	Frequency (n)	Percent (%)
Highly satisfied (75-100%)	173	40.7
Satisfied (50-74%)	236	55.5
Unsatisfied (0-49%)	16	3.8

The above table illustrates that more than half of the respondents (55.5%) are satisfied with maternity services, 40.7% are highly satisfied and only least respondents (3.8%) are unsatisfied.

Table 5: Association of Socio-demographic Variables with Level of Mothers' Satisfaction

Variables	Satisfied F (%)	Highly Satisfied F(%)	X²	p- value
Age in years				
< 19	(12.1)	(19.3)	4.757	0.190
20-25	(58)	(53.2)		
26-30	(22.7)	(22.5)		
above 30	(7.2)	(5)		
Ethnicity				
Bramin/chhetri	66(31.9)	72(33.04)	4.302	0.367
Janajati	103(49)	105(48.2)		
Dalit	19(9.2)	28(12.8)		
Terai/Madhese	19(9.2)	12(5.5)		
Muslim	-	1(5)		
Religion				
Hindu	179(86.5)	194(89)	2.931	0.402
Buddhist	22(10.6)	15(6.9)		
Christian	6(2.9)	8(3.7)		
Others(Islam)	-	1(5)		
Educational status				
Never attended school	15(7.2)	8(3.7)	4.829	0.185
Primary level	43(20.8)	50(22.9)		
Secondary	47(22.7)	63(28.9)		
Higher secondary and more	102(49.3)	97(44.5)		
Residence				
Chitwan	98(47.3)	90(41.3)	1.344	0.209
out of chitwan	109(52.7)	128(58.7)		
Employment status				
work at home	188(90.8)	192(88.1)	1.243	0.537
Business	7(3.4)	12(5.5)		

Job	12(5.8)	14(6.4)		
Variables	Satisfied F (%)	Highly SatisfiedF(%)	X²	p- value
Gravida				
First	105(50.7)	127(58.3)	4.136	0.247
Second	87(42)	74(33.9)		
Third	11(5.3)	15(6.9)		
fourth or more	4(1.9)	2(0.9)		
Pregnancy status				
Planned	181(87.4)	196(89.9)	0.646	0.422
Unplanned	26(12.6)	22(10.1)		
Number of children				
One	109(52.7)	131(60.1)	0.358	0.187
Two	89(43)	75(34.4)		
Three or more	9(4.3)	12(5.5)		
Waiting time on admission to receive service				
15 minutes	116(56)	154(70.6)	13.830	0.003*
30 minutes	28(13.5)	30(13.8)		
1 hour	25(12.1)	14(6.4)		
more than 1 hour	38(18.4)	20(9.2)		
Stay in hospital before delivery				
1-3 hours	50(24.2)	50(22.9)	0.212	0.976
4-6 hours	37(17.9)	42(19.3)		
7-9 hours	23(11.1)	23(10.6)		
10 hours and above	97(46.9)	103(47.2)		
Duration of labour				
<12 hours	109(52.7)	118(54.1)	2.907	0.406
12 hours	51(24.6)	42(19.3)		
>12 hours	47(22.7)	57(26.1)		
Sex of baby				
Male	98(47.3)	98(45)	0.157	0.692
Female	109(52.7)	120(55)		
Reason for choosing service				
Quality Services	90(43.5)	109(50)	8.946	0.01*

Nearer	91(44)	67(30.7)
Referral from any institution	26(12.6)	42(19.3)

Table 6: Association of Obstetrics Variables with Level of Mothers' Satisfaction

*Significantly associated factors ($p < 0.05$)

Discussion

The present study determined the level of mothers' satisfaction on maternity care services in bharatpur hospital Chitwan, Nepal. The mean age of the respondents was 22.71 (± 3.975) years; the minimum age was 15 years and the maximum age was 37 years which is comparable to study conducted in india (Jha, 2017) the mean age was 23.7 years (± 3.4). In similar study conducted by Changee(2015) the mean age of the participants was 31.4 (± 5.0) years which is more than the recent study. The current study revealed that who have higher education have highly satisfied compared to less educational level. Regarding pregnancy status who have planned pregnancy were highly satisfied who did not. In similar study done by Amdemichael (2014) and reported that less educated mothers have higher satisfaction than higher educated which result is inconsistency with current study result. Regarding pregnancy status the result is consistency.

The study found that majority of the respondents(70.6%) who have less waiting time to receive the service during admission were highly satisfied compared to waiting time more than 30 minutes. Maternal satisfaction was associated with waiting time to receive the service and with the quality of services that the main reason of choosing the institution to delivered rather than referral from somewhere. Similar findings were reported in study conducted in public health facilities in Southwest Ethiopia by Tesfaye(2016). Also this finding was consistency with the study conducted by Tayelgn et al. (2011).

In the study more than half of the respondents (55.5%) are satisfied and 40.7% are highly satisfied with maternity services and it is lower than a study conducted by Melese et al, (2014) in maternity hospital in Ethiopia (79.1%) but it is higher than a study conducted in tertiary hospitals of western, Nepal, overall 45.1% of mothers were satisfied with the perinatal care (Regmi et al, 2017). Among the respondents who are highly satisfied toward maternity services are found in the items privacy maintained during procedure and information provided about postnatal and newborn care. These result were analogous to a study conducted on Clients' satisfaction with quality of childbirth services by Okumu (2018) which found that clients from both public and private facilities were satisfied in all aspects of privacy and confidentiality during labour and delivery and a higher percentage of clients from public facilities agreed that they were provided with information on detection of danger signs in mother and in the baby after delivery, information in regard to self-care and baby care before discharge. In the current findings on most of the items respondents expressed neutral responses that is neither good nor bad. In the study it was categorized as satisfied. More than half of respondents are dissatisfied with the items information provided about mother and fetal condition and special care and help provided during and after delivery to the mother. This finding is similar in the study conducted by Agumasie (2018) that there was dissatisfaction in professional and technical aspects.

Conclusion

The study showed that more than fifty percent respondents were satisfied on maternity care services and only least number of respondents were unsatisfied. It also concluded that compared to other public hospitals of Nepal the level of satisfaction is higher on delivery care services in this institution. Maternal satisfaction was associated with waiting time to receive the service and with the quality of services that the main reason of choosing the institution. Other obstetrics factors and socio-demographic factors were not

significantly associated with satisfaction on maternity services. They answered that service is satisfactory though there is need to improve the services if respondents to be a highly satisfied in all aspects of care.

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PHYSICO-CHEMICAL EFFECTS OF SAND HARVESTING ON WATER QUALITY IN RIVER THWAKE MACHAKOS COUNTY, KENYA

Mwanzia Tabitha Nzula*, Gathuru Gladys* and Kitur Esther*

* Department of Environmental Sciences, Kenyatta University, P.O. Box 43844 - 00100 Nairobi, Kenya.

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ABSTRACT- A study was conducted to assess the physico- chemical effects of sand harvesting in River Thwake, Machakos County- Kenya. A total of 8 water samples from a sand harvesting site (point A) and no-sand harvesting site (point B) were collected and analyzed for; temperature, Hydrogen Potential, turbidity, color, electrical conductivity, Lead, Copper, Zinc, Iron, Biological Oxygen Demand and Chemical Oxygen Demand. There were significant differences in the means of point A and B water samples as regards to; color ($p=0.001$), turbidity ($p=0.001$), Iron ($p=0.001$) Chemical Oxygen Demand ($p=0.001$) and Zinc ($p=0.02$) which was associated with sand harvesting activities at point A. However, Copper ($p=0.54$), conductivity ($p=0.17$), temperature ($p=0.93$), Hydrogen Potential ($p=0.09$), Lead ($p=0.85$), Biological Oxygen Demand ($p=0.63$) mean scores were not significantly different despite sand harvesting activities. The results were compared with WHO guidelines, 2009 and Kenya Bureau of Standards 2006 water guidelines to ascertain its suitability for domestic use.

INDEX TERMS- Environmental management plan, sand, sand harvesting, sustainable resource utilization

1. INTRODUCTION

Sand is a type of soil formed through weathering and soil erosion. It is characterized by small fragments of rocks that come in various sizes and shapes. When compared to other natural occurring minerals, sand resources have been considered as the most abundant making them easily accessible. Sand resources are important in infrastructural development as they are used for construction purposes (5). This is reaffirmed by other scholars who acknowledge the importance of sand and its aggregates for making of slabs, beams and pillars that are used for construction and as such a contributor to the growth of economies around the world through infrastructural development (11). Sand plays an important role in the environment as it maintains environmental aesthetics, helps in reducing water evaporation and enhances water purification thus improving the water quality in rivers (12).

According to (13) water quality is the evaluation of the physical, chemical and biological composition of water in relation to its uses, natural quality and human effects. Rivers are surface water sources and among the challenges associated with surface water is pollution and contamination. This may be caused by anthropogenic activities carried out in the water body or the area around the water body. Water quality is of importance as rivers provide water supply for both domestic and industrial purposes as well as provide habitats for aquatic life (1) Therefore, it is essential to ensure that the integrity of water is upheld to ensure quality water is available for domestic and industrial usage and to sustain the aquatic ecosystem.

Sand harvesting is done on large scale and small scale also called artisan sand harvesting. Artisan sand harvesting is characterized by the use of simple tools such as; shovel, hand hoes, wheelbarrows whereas large- scale sand harvesting is mechanized (8). It can be done both on land and inside water bodies where the sand occurs. Research by various scholars from different areas has shown that sand harvesting contributes to pollution in different ways (6). Pollution reduces the water quality in the river due to the introduction of microorganisms that may lead to waterborne diseases to the humans and tampers with the physico- chemical composition of water making it unsuitable for the survival of aquatic life (10).

Some of the physiographic problems associated with sand harvesting includes; the alteration of the river as a result of scooping and dredging of sand from the river, erosion and degradation of arable land adjacent to the river, oil spills resulting from the moving lorries and poor disposal of water during sand harvesting (11). Sand harvesting also modifies the physico-chemical composition of river water by influencing the pH, BOD, COD, increasing turbidity, temperatures, conductivity as well as the presence of heavy

metals such as Copper and Iron (7). The alteration of these water properties and the riparian land poses risks to aquatic life and the human using the water (2).

Further, sand is a finite natural resource from the environment and if it not sustainably managed, it would be overexploited leading to its depletion since the rate at which it rejuvenates is very slow compared to the rate of extraction (5). Despite the existence of regulatory law governing sand harvesting, it continues to be done illegally and in an unregulated manner within Machakos County and the rate of extraction overweighs the rate of regeneration of the resource creating a problem (9). Communities dependent on these resources to sustain their social and economic status will suffer as a result of the dwindling sand resources thus increasing poverty in those communities (8 and 9). Therefore, this research sought to establish the impact of sand harvesting on the water quality of River Thwake in Machakos County.

Machakos County has vast sand resources both on land in its rivers and streams. Among the major rivers in the County is River Thwake that supplies water to the local community and feeds into the Athi River downstream. The Unsustainable sand harvesting in River Thwake has raised concerns from both the local community and the County Government. Therefore, in addition to the National Sand Harvesting Regulation of 2007, the County Government formulated the Machakos Sand Harvesting Bill of 2014 to help regulate the sand harvesting sector.

Unfortunately, despite the existence of the two regulations, sand harvesting is still done illegally and in an unregulated manner in the county (9). The rationale of this study was therefore to establish the physico- chemical, effects of sand harvesting on the water quality of River Thwake in Machakos and how to best utilize the sand resources while ensuring minimal negative impacts to the environment and the community in order to improve the livelihoods of the locals and promote sustainability of the natural resource through conservation.

2. STUDY AREA

The research was carried out in Machakos County, which is composed of six constituencies namely; Kathiani, Kangundo, Machakos Town, Masinga, Yatta and Mwala. The River Thwake study area is confined within coordinates 1°24'46.7"S and 37°19'51.4"E (figure 3.1) and is approximately 60- 70 kilometers from Nairobi. Iveti hills in Machakos are the catchment area for River Thwake which finally flows into Athi River.

The climate of the area is hot and dry (3). Rainfall is bimodal, long rains that starts end of March and stretches to May whereas the short rains that occur between Octobers and December. The region's annual rainfall average is between 500 mm– 1300 mm though it varies among the constituencies in the County and is affected by altitude. Therefore, reliability of rainfall in the area is quite low. The temperatures range between 18 degrees Celsius to 25 degrees Celsius. July is the coldest month while March and October are the hottest months in the County (4).

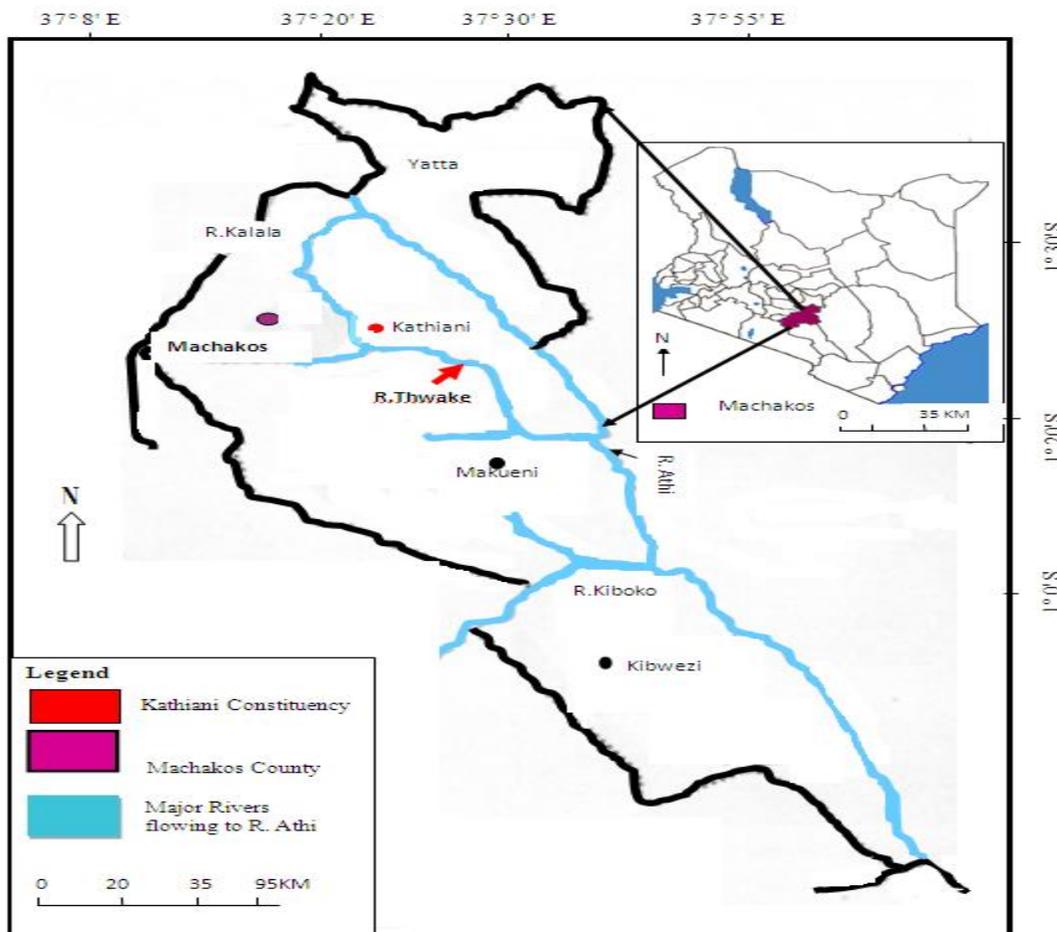


Figure 3.1: Map showing River Thwake that flows in Kathiani, Machakos County (Modified from Machakos Intergrated Development Plan, 2015)

3. MATERIAL AND METHODS

a) Sample Area, Sample Collection and Preservation

This study sought to establish the impact of sand harvesting on the water quality of River Thwake. It was achieved through the testing of water samples from two different points (A- 1°28'17.6"S and 37°24'30.6"E) and (B-1°27'44.6"S and 37°24'36.1"E) in the river. Each sampling point was recorded by GPS (Global Positioning System).

For water sampling, a scooper was dipped inside the river to a depth of 30cm. Water was sampled from point A and directly opposite point A (across the river) at 1.5m from the shore of the river. The two samples were then mixed in a bucket to form the composite sample then transferred into 1.5 liter pre-sterilized bottles. Water sampling from the identified points A and B was done at two weeks intervals for a period of two months between June and September, 2016. The same routine was repeated for point B upstream and the results compared to those of point A.

At the sampling points, water samples were collected in 1.5 liter plastic bottles that had been washed using detergent then thoroughly rinsed with distilled water. At the sampling sites, the bottles were later rinsed again with the sample water before the actual sampling. For BOD analysis, 3 liter bottles were used for water sampling on either sides of the identified sampling points and the samples were then mixed in a bucket to form the composite sample. All samples were then labeled accordingly and stored in an icebox to avoid contamination then delivered to the Ministry of Mines and Geology and Water Resource Management Authority laboratories for further analysis. Physical parameters that were tested included; temperature pH, color, turbidity and electrical conductivity whereas the chemical parameters included; Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and heavy metals; Copper (Cu), Zinc (Zn), Lead (Pb) and Iron (Fe).

b) Physico-chemical Analysis

The temperature of the water was measured using a thermometer (Hanna H193510 model). The thermometer was immersed in water to a depth of 10cm, allowed to stabilize and temperature recorded in °C. The pH of the water was measured using a portable Winlab Dataline (PROFI-BOX SET 1) pH meter. The pH meter was fully calibrated to 25°C and immersed in the water to a depth of 10cm. The reading was allowed to stabilize. The stabilized reading was then recorded. Electrical conductivity was measured using Model Con 200 portable conductivity meter calibrated to 25°C. It was immersed to a depth of 10cm, allowed to stabilize and the reading recorded. The unit of measurement used was milliSeimens per centimeter. Turbidity was measured in Nephelometric units using Model 6035 JENWAY portable turbidity meter that measure light when scattered at 90 degrees. The water sample was shaken, allowed to settle to remove the bubbles and put inside a clean tube that was placed in a calibrated meter. The readings from the meter were afterwards recorded. To establish the level of BOD, the BOD5 test was administered and after a 5 days incubation period. Before the water samples were incubated, the amount of dissolved oxygen was determined and then compared to the results after the five days at 20 degrees Celsius. The final BOD reading was determined by subtracting the readings from of the initial first reading and the final reading after the incubation and was expressed in milligrams per liter. The COD was determined by Redox titration that involved incubating water sample with potassium dichromate as the chemical oxidant in combination with sulfuric acid. The catalyst used was silver sulfate and mercuric sulfate was added to remove the chloride. The excess dichromate was titrated with ferrous ammonium sulfate and orthophenanthroline as the indicator in the reaction. From the titration, the average COD value was recorded and expressed as milligrams per liter. The concentration of Copper, Zinc, Lead and Iron was analyzed using Atomic Absorption Spectrometry (AAS). The AAS provided accurate and fast determination of the heavy metals. It used wave lengths of light of the specific elements to determine the concentrations of the respective heavy metals in the water sample

c) Statistical Analysis

Using Statistical Package for Social Sciences version 20 and Independent Sample T test was used to test the hypothesis that sand harvesting significantly affects water quality by analyzing the physico- chemical parameters of water samples collected from point A and B of River Thwake which were compared to the set limits international limits of WHO and local limits of KEBS.

4. RESULTS AND DISCUSSION

The temperature recorded in point B (table 4.2) ranged between 22°C and 23 °C as well as those from point A that also ranged between 22°C and 23°C recorded similar mean results of 22.5°C (table 4.1). An independent sample *t* test showed a non- significant difference between the mean temperatures from water samples in point A and B $t(6) = -0.09$, $p = 0.93$ (table 4.1). The above results imply that sand harvesting did not necessarily affect the water temperature of the water since point A and B recorded similar temperature results.

Turbidity in point A ranged between 299.00 NTU and 400.00 NTU and recorded a mean of 358.75 NTU (table 4.1) as compared to point B whose turbidity ranged between 48.50 NTU and 65.70 NTU and recorded a mean of 55.95 NTU (table 4.2). The turbidity results of an independent sample *t* test analysis (table 4.1) between the means of water samples of point A and B found a significant difference of $t(6) = 13.568$, $p = 0.001$. The increased turbidity in point A could be because of the presence of increased suspended particles arising from sand harvesting. It could also be due to other sand harvesting associated activities such as the movement of the lorries carrying the sand and people that increases dust and other solid particles in the air and river water.

TABLE 4.1: Descriptive Statistics of Water from a site with Sand Harvesting

	N	Range	Min	Max	Mean	Std. Dev
Physical Parameters						
pH (1-14 scale)	4	1.29	7.52	8.81	8.2725	.60813
Color (mgPt/l)	4	25.00	100.00	125.00	112.5000	14.43376
Turbidity (NTU)	4	101.00	299.00	400.00	358.7500	43.89666
Conductivity ((μ S/cm)	4	229.00	1120.00	1349.00	1269.7500	102.08289
Temp ($^{\circ}$ C)	4	.90	22.10	23.00	22.4500	.38730
Chemical Parameters						
Pb (mg/l)	4	.04	.00	.04	.0250	.01915
Cu(mg/l)	4	.02	.00	.02	.0100	.01155
Zn (mg/l)	4	.02	.00	.02	.0150	.01000
Fe(mg/l)	4	16.90	30.05	46.95	40.0875	7.30107
BOD (mg/l)	4	72.00	18.00	90.00	53.5000	29.94996
COD (mg/l)	4	65.00	124.00	189.00	151.0000	27.96426

The pH of the water in point A (table 4.1) ranged between 7.52 and 8.81 with a mean of 8.27 whereas point B ranged between of 7.37 and 7.99 with a mean of 7.61 (table 4.2). The pH mean levels varied from the two sites with point B recording the lowest mean (table 4.2). An independent sample *t* test (table 4.3) indicated that there was no significant difference between the pH mean levels of point A and point B $t(6) = -1.980, p = 0.095$ (table 4.3). The slight increase in alkalinity in point A could have been caused by the method of sand harvesting used in the area that usually involves digging and scooping of sand hence causing friction and abrasion of the alkaline parent rock which mixed with water making the water more alkaline. The alkalinity in the water could also be due to the presence of Magnesium Carbonate rocks and Calcium in the water, when the rocks weather and react with water, the water naturally becomes alkaline⁷.

The results showed varied color concentrations in the two water samples (table 4.2). Water samples from point A (table 4.1) ranged between 100mgPt/l to 125mgPt/l and recorded a mean of 112.5mgPt/l whereas water samples from point B ranged between 40mgPt/l and 50mgPt/l and a mean of 47.5mgPt/l (table 4.2). An independent sample *t* test was done and showed a significant difference in the scores of color from point A and point B, $t(6) = 8.510, p = 0.001$ (table 4.3). These results imply that sand harvesting affects water color by increasing its concentrations. The increased color intensity results from the particulates in the water brought about by sand harvesting and related activities.

TABLE 4.2: Descriptive Statistics of Water from a site Without Sand Harvesting

	N	Range	Min	Max	Mean	Std. Dev
Physical Parameters						
pH (1-14 scale)	4	.62	7.37	7.99	7.6075	.28547
Color (mgPt/l)	4	10.00	40.00	50.00	47.5000	5.00000
Turbidity (NTU)	4	17.20	48.50	65.70	55.9500	8.07321
Conductivity ((μ S/cm)	4	296.00	1028.00	1324.00	1144.2500	126.29694
Temp ($^{\circ}$ C)	4	.90	22.10	23.00	22.4750	.38622

Chemical Parameters	0					
Pb (mg/l)	4	.04	.00	.04	.0275	.01893
Cu(mg/l)	4	.02	.00	.02	.0050	.01000
Zn (mg/l)	4	.02	.00	.02	.0050	.01000
Fe(mg/l)	4	2.20	5.20	7.40	6.2250	.91059
BOD (mg/l)	4	30.80	34.00	64.80	45.0500	13.55224
COD (mg/l)	4	30.00	2.00	32.00	22.2500	13.81726

The Electrical Conductivity recorded in point A ranged between 1120 μ S/cm and 1349 μ S/cm and a mean of 1269.8 μ S/cm (table 4.1) whereas those recorded in point B ranged between 1028 μ S/cm and 1324 μ S/cm and a mean of 1144.3 μ S/cm (table 4.2). Compared to the WHO and KEBS limits, the Electrical conductivity of both samples was above the acceptable limits meaning that the water had a high content of dissolved ions thus raising the electrical conductivity. Further, an independent sample *t* test (Table 4.3) showed a non-significant difference of mean between water samples of point A and point B $t(6) = 1.546, p = 0.17$.

From the results (table 4.1), the COD in the water at point A ranged between 124 mg/l and 189mg/l with a mean of 151mg/l as compared to the water from point B that ranged between 2mg/l and 32mg/l with a mean of 22.3mg/l (table 4.2). These limits are high than the WHO and KEBS acceptable limits (table 4.5). The COD scores after an independent sample *t* test showed significant differences in the scores in the means of water samples from point A and point B $t(6) = 8.255, p = 0.001$ (table 4.4). These results suggest an increase in COD concentrations in point A which can be associated with the sand harvesting activities in that section of the river. It could also be caused by the anthropogenic activities within and outside the river that lead to decay of organic matter and the pollution in the river.

The BOD levels in both sites (point A and B) were both high than WHO and KEBS limits of 0.00 mg/l. Point B (table 4.1), BOD concentrations ranged between 34mg/l and 64.80mg/l and recorded a mean of 45.1mg/l whereas that of point A (table 4.2) ranged between 18 and 90 and recorded a mean of 53.5mg/l. An independent sample *t* test was done and recorded non-significant score of $t(6) = 0.5, p = 0.63$ in the means of point A and B (table 4.4). Although the BOD levels of both sites was high, it is evident from the results that site A had a higher level which can be because of the sand harvesting in that section of the River. These high levels of BOD in the water imply that the water was contaminated hence the high content of bio-degradable matter. Contamination could have been due to the anthropogenic activities inside and outside the

The levels of Lead metal in point A and B was shared and ranged between 0.00 mg/l and 0.04mg/l. The recorded mean in both points A and point B (table 4.1 and 4.2) were 0.02mg/l which is within the acceptable limits of WHO of 0.05 but outside the KEBS limits of 0.01 (table 4.5). An independent sample *t* test showed a non-significant difference in the mean scores of Lead (Pb) in point A ($M = 0.025, SD = 0.0192$) and point B ($M = 0.027, SD = 0.0189$), $t(6) = -0.186, p = 0.859$ (table 4.4). These trace concentrations of Lead could be as a result of indiscriminative disposal of wastes with Lead contents into the water body thereby releasing Lead into the river or the parent rock that may contain some trace amounts of Lead.

Copper metal levels in point A and B were shared and ranged between 0.00 mg/l and 0.02 mg/l and recorded a mean of 0.01 mg/l (table 4.1 and 4.2). After and independent sample *t* test (table 4.4), Copper showed non-significant difference in the mean scores of point A ($M = 0.010, SD = 0.012$) and point B ($M = 0.005, SD = 0.010$), $t(6) = 0.655, p = 0.537$. Both levels from the two sites are within the KEBS and WHO limits 1.000 mg/l (table 4.5). However, it should be noted that the sand harvesting site had a slightly higher recording when compared to the site with no sand harvesting activities. Implying the sand harvesting activities made Copper easily available probably due to water and rock disturbance as a result of scooping of sand from the river.

The Zinc levels in point A and B were also shared and ranged between 0.00mg/l and 0.02 mg/l with the mean of 0.01 mg/l (table 4.1 and 4.2). An independent sample *t* test showed the mean scores of Zinc in point A and B were not significantly different $t(6) 1.414, p = 0.207$ (table 4.4). These results suggest that sand harvesting had no impact on the level and availability of Zinc in the River. This could be because the parent rocks did not contain high levels Zinc in their composition hence the trace amounts of the metal.

TABLE 4.3: A comparison of the Physical parameters of sand harvesting and no sand harvesting site along River Thwake

Physical Parameters	Sand harvesting site		No sand harvesting		T-Test
	Mean	Std. Dev	Mean	Std. Dev	
pH (1-14 scale)	8.3	.6	7.6	.3	0.09
Color (mgPt/l)	112.5	14.4	47.5	5.0	0.001
Turbidity (NTU)	358.8	43.9	55.9	8.0	0.001
Conductivity (µS/cm)	1269.8	102.1	1144.3	126.3	0.17
Temp (°C)	22.5	.4	22.5	.4	0.93

TABLE 4.4: A comparison of the Chemical parameters of sand harvesting and no sand harvesting site along River Thwake

Chemical Parameters	Sand harvesting site		No sand harvesting		T-Test
	Mean	Std. Dev	Mean	Std. Dev	
Pb (mg/l)	.03	.02	.03	.02	0.85
Cu(mg/l)	.01	.01	.01	.01	0.54
Zn (mg/l)	.02	.01	.01	.01	0.20
Fe(mg/l)	40.1	7.3	6.3	.91	0.001
BOD (mg/l)	53.5	29.9	45.1	13.6	0.63
COD (mg/l)	151.0	27.9	22.3	13.8	0.001

The concentration of Iron metal in point A was higher than the recommended limits by WHO and KEBS of 0.10mg/l and 0.30mg/l respectively. Point A Fe levels ranged between 30.05mg/l and 46.95mg/l with a mean of 40.09mg/l (table 4.1) whereas those of point B ranged between 5.2mg/l and 7.4mg/l and the mean was 6.23mg/l (table 4.2) indicating that sand harvesting increased the concentration of Iron in the water sampled. After an independent sample *t* test, Fe mean scores were significantly different between point A (M = 40.0875, SD = 7.30107) and point B (M = 6.2250, SD = 0.91059), *t* (6) = 9.205, *p* = 0.001 (table 4.4). The high levels of Fe could be due to the geology of the area and the tools (hand hoes and shovels) used in the sand harvesting activities that could have been made out of Iron thus contributing to the high levels of Iron in the water.

TABLE 4.5: WHO and KEBS guidelines for drinking water quality

Parameters	SI Units	KEBS	WHO
Turbidity	NTU	5	5

Conductivity	µS/cm	-	300
pH	pH scale	6.5-8.5	6.5-9.2
Color	mgPt/l	15	15
Temperature	°C	-	-
BOD	Mg/L	0.00	0.00
COD	Mg/L	0.00	0.00
Lead	Mg/L	0.01	0.05
Iron	Mg/L	0.30	0.10
Zinc	Mg/L	5.00	5.00
Copper	Mg/L	1.00	1.00

5) CONCLUSION

The study established that sand harvesting along River Thwake in Machakos County was influenced by many socio- economic benefits associated to the activity which included; the provision of employment, generation of income and infrastructural development. These factors have led to the increased, unsustainable and indiscriminate sand harvesting in the area leading to the associated negative effects on the community, the environmental status of riparian land and on water quality. Indiscriminate and harvesting activities overlooked the associated benefits resulting from sand resources which included; water purification, aesthetics and the maintenance of aquatic ecosystem by compromising water quality in the river by interfering with the physico-chemical properties of the river.

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AUTHORS

First Author: Ms. Tabitha N. Mwanzia, Dept. of Environmental Sciences, Kenyatta University, mwatabitha@gmail.com

Second Author: Dr. Gladys Gathuru, Dept. of Environmental Sciences, Kenyatta University, gathuru.gladys@ku.ac.ke

Third Author: Dr Esther Kitur, Dept. of Environmental Sciences, Kenyatta University, kitur.esther@ku.ac.ke

CORRESPONDENCE AUTHOR

Ms. Tabitha N. Mwanzia, Dept. of Environmental Sciences, Kenyatta University, mwatabitha@gmail.com, +254 726576960